A STUDY OF REPRODUCTIVE AND CHILD HEALTH AMONG THE LOIS OF IMPHAL VALLEY

By

TONJAM JOSHILA CHANU

DEPARTMENT OF ANTHROPOLOGY

NORTH EASTERN HILL UNIVERSITY
SHILLONG – 793022

OCTOBER, 2007

A STUDY OF REPRODUCTIVE AND CHILD HEALTH AMONG THE LOIS OF IMPHAL VALLEY

By

TONJAM JOSHILA CHANU

DEPARTMENT OF ANTHROPOLOGY

THESIS SUBMITTED

TO

THE NORTH EASTERN HILL UNIVERSITY

FOR PARTIAL FULFILLMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ANTHROPOLOGY

NORTH EASTERN HILL UNIVERSITY

SHILLONG – 793022

OCTOBER, 2007

DECLARATION

I, **Tonjam Joshila Chanu**, hereby declare that the subject matter of this thesis entitled "**A Study of Reproductive and Child Health among the Lois of Imphal Valley**" is the record of work done by me, that the contents of this thesis did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/ Institute.

This is being submitted to the North Eastern Hill University for the degree of Doctor of Philosophy in Anthropology.

(Tonjam Joshila Chanu)

Supervisor and Head: (R. Khongsdier)

ACKNOWLEDGEMENT

I wish to express my deep heartfelt gratitude to my supervisor Prof. R. Khongsdier, Head of Department of Anthropology, NEHU for his valuable suggestions and untiring guidance with constant encouragement throughout the study, without which this work could not have been brought into its present form. In addition, Prof. R. Khongsdier deserves the highest praise for his forbearance in coping up with the colossal number of alterations throughout my prolonged and demanding pursuit.

I am also very much thankful to Prof. T.B. Subba, for his suggestions and personal encouragement throughout the year.

I specially wish to express my gratefulness to Dr. B. Francis Kulirani Head of Office, Anthropological Survey of India NERC, Shillong, for his interest, personal encouragement and sustained help in supplying the secondary materials related to the present work. I am also grateful to all my friends and colleagues of the Department and Anthropological Survey of India, NERC Shillong, for their manifold support.

I am also very thankful to the People of Sekmai, Kourtuk and Phayeng for their unremitting help and warm hospitality throughout the year.

Last but not least, I am very grateful to my family members, especially to my father and mother, I owe a debt for bearing with me the innumerable hardships, but at the same time encouraging me to complete my work.

And above all to GOD Almighty, for everything.

Tonjam Joshila Chanu

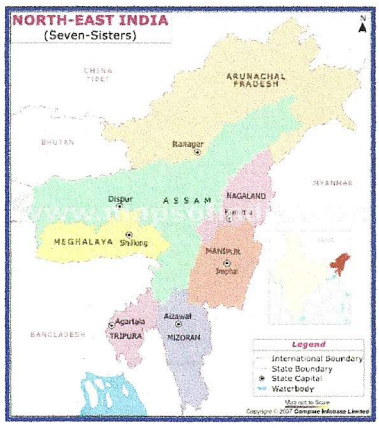
Shillong

The October 2007.

CONTENTS

List of Tables

List of Figures



SEKMAI

PHAYENG

KOURTUK

CHAPTER I
INTRODUCTION

In their attempt to understand human variation and evolution, physical anthropologists have also realized the need to understand the relationship between human biology and culture, especially to those aspects relating to health and nutrition, and various socio- cultural factors. The study of genetic diversity and its linkage, for example, with health and culture has become a major interest in biological anthropology. In fact, it is now believed that human biological processes are largely influenced by various socio-cultural aspects of the human society. Thus, it is important on the part of physical anthropologist to undertake such studies with a view to understanding not only the process of human evolution but also the health and nutritional aspects of human populations, thereby the survival and well-being of human populations.

This thesis is an attempt to deal with the reproductive and child health among the Lois of the Imphal Valley with a view to understanding how certain indicators of the reproductive and child health are associated with demographic, biological and socio-economic variables of the study population.

According to the United Nations (UN, 1994), "Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and that they have the capability to reproduce and the freedom to decide if, when, and how often to do so. Implicit in this last condition are the rights of men and women to be informed and have access to safe, effective, affordable and acceptable methods of family planning of their choice. It also includes the right of access to other methods of their choice for regulation of fertility, which are not against the law, and the right of access to appropriate health-care services that will enable women to go safely

through pregnancy and child birth and provide couples with the best chance of having a healthy infant. Also included is sexual health, the purpose of which is the enhancement of life and personal relations, and not merely counseling and care related to reproduction and sexually transmitted diseases."

Reproductive health is now internationally understood to be a cornerstone of sustainable development. Improving reproductive health is not only essential for improving the overall health status of populations but also crucial to the attainment of gender equity. With the growing pandemic of HIV/AIDS and sexually transmitted infections in many countries of the world, the need for governments to focus on reproductive health has never been greater. According to WHO (2002) efforts to achieve reproductive health involve a wide range of health promotion and preventive measures. Of all the health challenges faced by different countries, those posed in relation to sexual and reproductive health are among the most daunting because they involve not only diseases but also normal components of life such as sexual maturation and pregnancy, surrounded by cultural, social, ethical and religious considerations. In no other aspect of health is the need for broad community involvement, alongside focused and effective interventions, so necessary.

The basic elements of reproductive health include "responsible reproductive/sexual behavior, widely available family planning services, effective maternal care and safe motherhood, effective control of reproductive tract infection (including sexually transmitted diseases), prevention and management of infertility, elimination of unsafe abortion and treatment of malignancies of reproductive organs" (WHO, 1978). In addition, reproductive health affects, and is affected by other aspects of health, especially HIV infection/Acquired Immune Deficiency Syndrome (AIDS), nutrition, infant and child health, adolescent health and sexuality, life style and environmental factors including social and cultural factors (WHO, 1978). In fact, several studies have revealed that the various components of reproductive health are interrelated and influenced by various biological, socio–cultural and environmental factors (Mosley and Chen, 1984). Thus, the subject of reproductive health is very vast and holistic in nature, and it is not simple to consider all its components and indicators in a given study, especially in the case of the individual research because it requires a technical knowledge from different fields, or disciplines. However, selection of few sensitive, specific and reliable indicators are also

meaningful, especially for screening or identifying the reproductive health problems of specific population at a given point of time which are required for immediate intervention (Park, 1994). Also, the reproductive health-care strategies should take into consideration women's multiple needs including education for responsible and healthy sexuality, safe contraception and appropriate services for sexual transmitted diseases, pregnancy problems, delivery and abortion (Sai and Nassim, 1989).

From the biological anthropological point of view, demographic variables (e.g., fertility, mortality and reproductive wastage), antenatal care, delivery characteristics and adoption of family planning methods, anemia, maternal and child morbidity (self-reported illness), immunization of the children, breast feeding and supplementation, educational and health facility, knowledge of sexually transmitted diseases (STDs), nutritional anthropometry of the mothers, physical growth and nutritional status of the children may be considered as important indicators of the child and reproductive health. An attempt to understand the relationship of these indicators with various cultural, social and economic factors may be very helpful in understanding the reproductive and child-health of a population.

Some recent studies have revealed that reproductive health outcomes are poor in many developing countries such as India (Hardee *et al.*, 1999; WHO, 2000). A recent review has shown that most efforts to estimate the prevalence of reproductive and the morbidity are generally based on measures of diseases (Sadana, 2000). As a matter of fact, there is a need to take into consideration the basic elements of reproductive health as mentioned above. For example, to understand how multiple factors are regulating maternal and child health, there is an urgent need to understand "biomedical factors within varying socio–economic and cultured contexts" (Pachauri, 1991). According to WHO (2002), there is also a need to have a more carefully developed research agenda to get an in-depth understanding of whether a given programme in a given country has been successfully implemented and whether the desired outcomes for various interventions have been achieved. Issues such as gender, quality of care and provider perspectives should all be considered as part of the research agenda. Many reproductive health issues are better addressed by a multidisciplinary research approach. Local academics should be encouraged to undertake this research with the support of international technical assistance if required.

Thus, the study of reproductive health may be considered one of the emerging health issues that need an interdisciplinary approach with a view to improving the health and well being of women and children. In the present study, an attempt will be made to understand the relationship of the child and reproductive health with various biological and socio-economic factors like age, sex, body dimensions, nutritional status, educational level, occupation, income and expenditure of the household, family size, religion, etc.

The main purpose of this thesis is to assess the present status of child and reproductive health among the Loi community of Manipur and to analyze and determine the major biological and socioeconomic determinants of the child and reproductive health in the study population. The research outcomes in this thesis are likely to provide basic information on child and reproductive health at the population level from Northeast India. It is also expected to serve as a model of bio-cultural approach to studying the health and survival of the Loi population, which will stimulate new research questions for future anthropological researches in Northeast India. In addition, the results of the present study are likely to help the policy markers and others in matters relating to improvement of the child and reproductive health in Manipur.

OBJECTIVES

In chapter II, we have given a brief review of literature and it reveals that in recent years more attention has been given to the study of the reproductive health. The review has highlighted that various biological, socio-cultural, and environmental factors have a great influence on reproductive and child health. Again, it has also revealed that maternal mortality and morbidity, demographic variables and family planning, anaemia, nutritional status, growth and development of children are widely used as the indicators of reproductive and child health. Such studies on the reproductive and child health are very limited in Northeast India particularly in the populations of Manipur, except those carried out by the National Family Health Survey (NFHS-2) (IIPS, 2000) at the state level. Therefore, we propose to undertake a reproductive and child health study among the Lois of Imphal Valley in West district of Manipur taking into consideration the following objectives:

1. To understand the reproductive and child heath of both rural and urban areas in term of demographic variables, maternal morbidity, hemoglobin level, body dimensions, family planning services and practices, antenatal care and immunization coverage.
2. To assess the nutritional status of children aged 3 to 7 years, using anthropometric measurements and indices.
3. To understand the effects of biological and socio- economic factors on the reproductive and child health.

STUDY AREA

Manipur is one of the small states in Northeast India (Figure 1). The state of Manipur lies between 23° 80′ N and 25° 68′ N latitude and 93° 03′ E and 94° 78′ E longitude. It is bounded by Mizoram and Burma on the north and by Nagaland on the south. On the east it is bounded by upper Burma and on the west by Cachar district of Assam. It covers an area of about 22,327 Sq. km, which is divided into 9 districts namely, Imphal West, Imphal East, Thoubal, Bishenpur, Churchandpur, Chandel, Ukrul, Senapati and Tamenglong.

According to 2001 census (census of India, 2001) the total population in the state is 23,88,634 of which are 12,07,338 males and 11,81,296 females. The sex ratio is about 978 females per 1000 males and the literacy rate is 68.78%. Manipur is ethnically heterogeneous. The people inhabiting Manipur can be divided into 2 broad categories: the tribal communities and the non-tribal communities. The tribal communities are divided into three groups, namely, Nagas, Chin-Kuki-Mizos and intermediary groups and the non-tribal population can be divided into three groups, namely, the Meitei, including the Lois, the Bishnupriyas and the Pangans (Manipuri Muslims), (Zehol, 1998). Most of the Manipuris belong to the Mongoloid group except for the Manipuri Muslims, Manipuri Brahmins and some new migrants from Assam and Bengal.

The present study was carried out in three Lois areas of Imphal West district namely; Sekmai which is 18km to the north of Imphal and Phayeng and Kourtuk which are 19 km and 17 km respectively to the West side of Imphal (Figure 1).

Soil and Climate

The physical composition of soil is loose and porous; therefore, it does not hold water. So they are generally light, except in the river valleys where silt has accumulated. The perpetual burning in course of shifting cultivation, in some parts of the hills, has rendered the soil devoid of humus. The soils of the central plain are transported ones and contain high proportion of clay.

The climate of Manipur is mostly pleasant throughout the year. There are two seasons separated by two short transitions. From November to February is the period of winter season and summer season commences from April and ends in September. Summer season is also a period of rains while October is the period of transition between summer and winter, so is the month of March, between winter and summer. The temperature in the central plain seldom touches freezing point, nor at any time of the year is extremely hot. In hill areas it is much cooler due to the effect of altitude.

Rainfall

The central valley, Imphal has an annual rainfall in between 1,600mm and 2,860mm. The rainy season is during May- September and little rainfall is experienced during the post monsoon period of October and November. From December, the North-East monsoon begins to blow in Manipur and extends up to February. The coldest month is January. From March the temperature starts rising and from October the temperature begins to drop.

Flora and Fauna

The flora of Manipur is very rich in a number of species. This is on account of the great diversity in temperature and rainfall in different parts of the state. In Manipur, different types of vegetation occur in definite belts even on the same mountains or plains. At the latitude of Manipur, forests occur up to an altitude of about 2,850 meters above the sea level. In the past, the state was richer in forests but now there is no forest in the valley as it is very thickly populated. The valley is still rich in aquatic flowers like the lotus and water lilies. The gorgon fruit (scientific term *Eurale fero*, local term, *thangjing*) grows in lakes, fens and ponds etc.

The state is rich in a large number of orchid varieties of which some are really beautiful. So, Manipur is one of the few places in India where there is such an abundant variety of beautiful orchids.

The fauna of Manipur is very interesting. The state has both the cold and hot region animals. The goral (local term *sabeng*) which is essentially an animal of cold regions is found in the state. On the hand, there is also the *Hyelaphus porcinus* (Local term *Kharsha*), an animal of the region of south east Asia, is also found in Manipur. But most birds and animals are those that are common in eastern India.

Among migratory birds, we may mention the parrot, the wag-tail, geese and ducks of different species including the Brahminy duck.

THE PEOPLE

In the present study, we shall deal with the Lois of the Imphal West district. They belong to the Mongoloid racial stock and speak a dialect known as *Chakpa*. They closely resemble the Meitei although certain shade of differences does exist with regard to few characteristic features. They believe in natural gods and goddess like *Koubru, Wangbren, Sanamahi.* They still follow their traditional occupations, such as pottery works, sericulture, distillation of liquor, rearing of pigs, which are considered as "derogatory" by the Meities (Das, 1985; Hodson, 1989). They also engage in weaving, business and services as their secondary occupation. At present, many of them have been absorbed into the Meitei community.

Origins and Characteristics

Lois is indigenous Scheduled Castes people of Manipur which is mainly distributed in different parts of the valley. They are called as '*Meitei Ariba*' in the local dialect. They belong to the Mongoloid racial stock and speak a dialect known as '*Chakpa*'. They were included in the list of the scheduled castes only in 1956 on the basis of an application submitted by Kh. Chaoba, President of the '*Chakpa-speaking Loi Association*' to the Additional Deputy Commissioner, Tribal Welfare (Das, 1985). With advent of Hinduism, the Meitei began to imitate caste system of the Hindus. The idea of touch ability and untouchability came to the minds of the Hindu Meitei. So, there was a time in the Meitei society when the Meitei degraded some Meitei who did not adopt Hinduism and did not mix, eat and sit with them. "Lois" is one such community who did not adopt Hinduism.

And for a long time, they were been treated as a separate tribe even though they belong to the same clans of the Meitei.

In the present study, the term "*Loi*" generally stands for the people who preserve the pre-Hindu traditions and customs of the Meitei. It may be noted that according to some scholars it also refers to the people who were banished to the penal colonies, as a punitive measure for some offences (Das, 1985). "King Khagemba one of the kings of Meitei seemed to be the first monarch to make use of the Loi villages as places of detention for prisoners...." Hudson (1989). Otherwise, the Lois and the other Meitei who have adopted Hinduism are to all intents and purposes indistinguishable from each other. The Lois claim that they are the autochthones of Manipur and their traditional customs, still being preserved, are same as those of the Meitei customs prior to their embracing of Hinduisms (Devi,2002).

The origin of the Meitei including the Lois is obscure. Hodson (1989) has proposed a common origin of the Lois and the Meitei and he writes, "In discussing the origin of the Loi communities, I found it necessary to set in array facts which clearly show that they are for the most part of the same origin as their Meitei master". Scholars have different views about the origins of the Meitei. Some scholars traced the origin of Meitei to the Mahabharata, some to China and South East Asia; some scholars try to prove that the Meitei were the Hindus from the prehistoric time thereby claiming to be of Aryan blood. Singh W, (1966) in his '*Early History of Manipur*' mentioned that, "The present Manipur State is the Manipur of Mahabharata. As I have said that in the Mahabharata and other Sanskrit literature, this country under review was called Manipur.....it was the same Manipur as mentioned there" Another group of scholars totally discarded the idea of Manipur being the Manipur of Mahabharata and began to trace its origin in South East Asia. Pemberton (1966) observed in this way, "we may safely conclude them (Meitei) to be descendants from a Tartar colony from China." Again, according to Roy (1973), "The fertile valley of Manipur witnessed the invasions of different tribes from time immemorial. At different periods, the Nagas, the Kukis, the Shans, the Chinese came and settled in this land and merged themselves into the Manipuri community. Some Aryan and Dravidian features are also found in them". And according to local version of the Lois, they believed that they have been living here since the creation of Universe and they are the descendents of '*Soraren*' (king of Gods) and descended directly from his abode (Devi, 2002).

The "*Lois*" are worshippers of traditional Meitei gods – the Imung Lais (household gods: referring to the traditional deities believed to be in the household), the Lamlais (wild country gods: referring to the deities believed to exist in the wild) and the Umang Lais (forest gods: referring to the deities believed to exist in forests) and Apokpa (ancestors). The Umang Lais and Apokpas are in some cases different from one community to another community and from one clan to another clan. But the common gods not only the Loi communities but also of the whole of the Meitei are 'Guru Sidaba', 'Sanamahi' and 'Leimaren Sidabi'. And the nature of worship of the 'Imung Lais', 'Umang Lais', 'Lam Lais' and 'Apokpa' are all similar in principle. The difference between the Hindu Meitei and Loi Meitei is that the Loi Meitieis generally do not worship a Hindu god. But now time has changed and there is a constant interaction between the "Lois" and Hindu Meitei (Devi, 2002). As a result, the Hindu Meitei has influenced the religious practices of the present day "Lois".

The general form of marriage is elopement. In case of arranged marriages, the parents take the consent of the boy and the girl. If a boy and a girl elope and live together they will be considered as husband and wife. If the parents of the girl do not like to perform "marriage ceremony" because of their unwillingness to the choice of their daughter, they will do 'Inthokpa' (boycott by parents). After sometime, the parents of the boy will request the parents of the girl for acceptance. Then 'Loukhatpa' (acceptance) is performed. Dowry is not compulsory for the Lois. Generally some gifts are given to the girl by the parents. In general cases, the Lois stick to their traditional customs with regard to marriage. But at present, in rare cases, the higher class Lois (better financial condition) due to social intercourses imitates the Hindu Meitei Marriage.

Occupation

The main occupations of the Lois are agriculture, silk manufacturing, smelting of iron, distilling of spirits, making of earthen vessels for containing water or for cooking in, cutting of posts and beams and canoes, manufacturing of salt, fishing, rearing of pigs etc. (Hodson, 1989; Das, 1985). They are also engaged in some other part time occupations such as cutting of firewood, quarry works and other such activities, while women folk are engaged in small cottage industries. Liquor making is another common occupation of the Lois in spite of its prohibition by the Government under the Bengal and Assam Excise Act

of 1910 since 1959 (Das 1985). Besides these traditional occupations, they are also engaged in business and government services.

Common Reproductive Health Practices

Among the Lois pregnancy of a woman is confirmed when menstruation stops for two months or so. Traditionally no special treatment is given to her and she has no to restrictions to observe. Lifting of heavy things and doing daily routine works are not prohibited in the early stages of pregnancy, but depending upon the health condition of a woman. During the advanced months of pregnancy, women are not allowed to walk long distances and they are discouraged from doing strenuous physical works. If they have to walk out during the night because of certain unavoidable circumstances, then they have to cover their head with cloths, otherwise, it is believed that they may be caught by evil spirits. There is no system of diets or restriction of any type of foods. Traditionally, a baby is delivered with the help of the village *Chabokpi* (a local mid-wife, also called Maibee). But at present, instances of delivering the child in hospital have taken place and even delivering at home is also done with the help of nurses. Usually, the umbilical cord is cut with a sharp razor. In earlier times, it was cut by with a sharp bamboo blade called *Wakthou*. The dismembered umbilical cord is then put inside a small earthen pot and buried at the right side of the main door in the case of boy and at left side in the case of girl. Normally the father does it. In the early days they fed the baby for the first time from a woman who has recently given birth to a baby. But nowadays, they have started giving mother's first milk to the baby. Normally a belt is worn by the woman to tighten up the loose muscles of the abdomen. During the early weeks of child birth, the mother also sleeps near the fire with the backside of her waist area exposed to the heat. This practice is believed to be helpful in purifying the blood of the mother and in the speedy recovery of the mother's health. After delivery, the mother washes her body with very hot water, at least two times in a day for at least a month. Right after delivery, the mother is allowed to eat only rice and fish which is fried without oil. In some families, they give boiled egg and chicken soup prepared by any family members. But a week after delivery, they were given curry fried without oil, mostly a curry of local yam stem called *Yendem*. It is believed that, this local yam has rich iron contain which helps in giving energy to the mother.

In Lois communities weaning period of the baby starts after completion of 3 months with pounded rice. Some families also give other solid foods like cerelac depending on the economic condition of the family. Breast feeding is continued up to 2 to 3 years or before getting another baby. When a baby gets sick they restrict their food habit.

Food habits

The Loi people are non-vegetarians, and rice is their staple food. They eat two major meals in a day - one in the early morning and other in the early evening. Large quantities of cooked rice, meat, and vegetables are consumed with various kinds of chutney, ginger, garlic, chilies, and spices. They also take pork, chicken and fish, depending upon their economic status. The Lois eats lots of hot chilli (pepper) but with very little spice. It is their common practice to eat pork and drink liquor in every occasion whether it be a marriage party, death celebration etc. Vegetables like potatoes, pumpkin, tomato, onion and various kinds of green leafy vegetables are some of their favorites. Milk is not a part of their regular diet. Morning tea is not a necessary item. Beverages are not taken into account in their dietary habit.

CHAPTER II

REVIEW OF RELATED LITERATURE

In the present chapter, we hall make a review of the literature related to the present study. The review is far from being exhaustive, but the main purpose is to get the general idea of the ongoing researches related to the present study, especially in India in general and in Northeast India in particular. The review will also focus only on the role of socioeconomic factors in influencing the maternal and child health based on certain indicators.

DEMOGRAPHY

In Chapter I, we have already pointed out that demographic parameters like fertility and mortality are very important to understand the reproductive health of a population. Of course, demographic study of population is a very important part of anthropological research. Demographic variables such as fertility and mortality are very important to understand the genetic and social structure of human population (Khongsdier, 2005c). In the present study, we are not concerned with the genetic structure of the population, but we shall look into certain socio-economic factors that may influence fertility and mortality as indicators of reproductive health.

It is widely accepted that fertility and mortality are influenced by a large number of biosocial factors like maternal age, parity, education, religion, economic conditions and so on (Kost and Amin, 1992; Bicego and Boerma, 1993; Freeny and Feng, 1993; Kapoor and Kshatriya, 2000; Wardatul, 2002; Omariba, 2006; Regassa, 2007, Andoh *et al.*, 2007). In the following sections, we shall make a brief review on how fertility and mortality are influenced by socioeconomic factors that are taken into consideration for the purpose of the present study:

Rural-urban setting

Several studies have shown that fertility is higher in rural areas than in urban areas (Ahmed, 1985; Retherford *et al.*, 1989; UN, 1999; Findley, 2005; Kullu, 2005 and 2006). Many studies have revealed that the rural urban differences in fertility is because of the differential impacts of various socio-economic factors such as maternal age, parity, education, occupation, religion, and so on (Arora, 1990; Galloway *et. al.*, 1998; Fagnani, 1991; Savas, 2001; Wardatul, 2002; Kullu *et al.*, 2006, Omariba, 2006). For instance Addai, (1999) has suggested that there are differences in fertility rate between rural and urban areas because of the differences in using contraceptive methods. Ahmed (1991) has observed that in Bangladesh, fertility is higher in rural areas than in urban areas due to early age at marriage. Again a study conducted by Abdullah Khan and Raeside (1994) on rural and urban fertility in Bangladesh shows that the higher fertility rate in rural than in urban areas is because of the differential effects of maternal education. Similarly, Do and Koenig (2007) has suggested that women residing in rural areas are likely to use less contraception than their counterparts residing in urban areas of Vietnam. Thus women residing in urban areas have fewer number children than those in rural areas. In addition, Mohammed, (1998) has suggested that because of the differential in standards of living, urban women have lower fertility rate than rural women in Arab countries.

In India also, Sinha (1987) has reported that fertility is higher in rural areas than in urban areas of Rajasthan due to higher age at marriage in urban areas. National Family Health Survey of India NFHS 1998-99 (IIPS and Macro, 2000) has revealed that high illiteracy rate is one of the factors for high birth rate in rural areas than in urban areas. Nayar (1986) has also observed that the spread of female education and improvement in medical and public health are important factors for the declined fertility rate in Kerala, although the impact is more in urban areas.

In Northeast India, little is heard about the rural-urban difference in fertility rate. However, NFHS (1998-99) has revealed that the fertility rate in all states of Northeast India is higher in rural areas than in urban areas. The rural-urban difference in fertility rate is highest in Meghalaya and lowest in Tripura (IIPS and Macro, 2000).

With respect to infant and child mortality, several studies have revealed that it is higher in rural areas than in urban areas (Keuzeta and Merlin, 1988; Barakani and Abdul-Rub, 1999; Eloundou- Enyegue, *et al.*, 2000; Macarra *et al.*, 2003; Chattopadhyay and

Roy, 2005; Andoh *et al.*, 2007). Many studies have suggested that higher infant and child mortality of rural areas over urban areas is due to the differences distribution of socio-economic characteristics in urban and rural areas (Sample Registration Bulletin, 1989; Curtis and Steele, 1996 Barakani and Abdul-Rub, 1999; Nagdeva and Bharati, 2003).

In China, Zhongwei, (2006) shows that the higher infant mortality rate in rural areas than in urban are due to the differences in the level of socio- economic conditions. Venkatacharya (1991) has reported that in Kenya child mortality in rural areas is higher than in large urban areas although the effects of other factors are controlled. Akoto and Tambashe (2006) have suggested that infant morality is low in rural areas than in urban areas of Tanzania due to rapid improvement in socio-economic conditions in rural areas. In Western Africa, Andoh *et al.* (2007) have observed that urban areas have less number of children than rural areas due to higher level of maternal education.

In India, Bandyopadhyay and Stewart, (1998) has reported that child mortality has been found significantly higher among rural (98%) than among urban areas (58%). The NFHS, 1998-99 has also revealed that rural mortality rates are considerably higher than urban mortality rates. It is also observed that the under-five year mortality rate is 64% percent higher in rural areas than in urban areas (IIPS and Macro, 2000). Nagdeva and Bharati (2003) have suggested that low maternal education, short birth interval, lack of medical treatment are the important factors for high infant mortality rate in rural areas than in urban areas of Andhra Pradesh. On other hand, Chattopadhyay and Roy (2005) have observed that in Maharasatra, the low standards of living of urban slums have high child mortality rate than rural areas. Similarly, Lata *et al.* (2000) have also concluded that infant mortality was more in urban slums areas compared to the rural areas of Ahmedabad.

In Northeast India, the National Family Health Survey 1998-99 has revealed that Meghalaya has the highest morality rates and Manipur and Mizoram have the lowest rates (IIPS and Macro, 2000). It is also observed that short birth intervals, large family size, low socio-economic and lack of medical facilities are the important factors for high mortality rate in rural areas of Northeast India.

Age at first marriage

Age at first marriage may be regarded as an important variable that affects fertility and mortality. Many studies have revealed the negative effect of age at marriage on fertility

(Bharati and Dastidar, 1990; Sengupta and Gogoi, 1995; Verma *et al.*, 1999; Peterson, 1999; Uchudi, 2001; Khongsdier, 2005c). In Africa, Cohen (1998) has suggested that late marriage as important driving forces behind the fertility declines. Letamo (1996) suggests that rising age at marriage contributed to the fertility decline by increasing the proportion of never married women in Botswana. As summarized by Lesthaeghe and Jolly (1995), the increase in the proportions of single women in the age-group 15–19 years contributes to a lowering of the overall fertility in as much as it is only partially offset by an increase in premarital teenage fertility. A similar observation has also been made by Freeney and Feng (1993).

Many studies conducted in India have also revealed that fertility rate declines with the increasing mean age at marriage (Bharati and Dastidar, 1990; Das and Dey, 1998; Verma *et al.*, 1999; Khongsdier, 2005c; Sahu, 2006; IIPS and Macro, 2007). In Northeast India also, Khongsdier (2005c) has shown that the mean number of live births per mother decreases with the rise in age at marriage of the mothers. It may however be noted that age at marriage is also associated with different socio-economic factors. Some studies also show that age at marriage is associated with socio-economic conditions thereby it is difficult to assess its direct impact on fertility (Gulati, 1988). Nevertheless, it is obvious from the findings on other populations that age at marriage has significant inverse association with fertility rate. Thus, it is imperative on the part of not only demographers but also the anthropologists to look into this problem in order to have a better understanding of the fertility trend in a population.

Education

Education, especially maternal education, is generally considered a key factor to development. It is closely related to demographic variables and other indicators of health and socioeconomic conditions of a population, or a nation as a whole. Female education is believed to have a great influence on the maternal and child health as it enhances the knowledge and skills of the mother concerning age at marriage, contraception, nutrition, prevention and treatment of diseases (Mosley and Chen, 1984). Moreover, maternal education is related to child health because it reduces the cost of public health programmes relating to information on health technology, increases household income and productivity of health inputs (McIntosh and Finkle, 1995). Thus it is suggested that the best health development agenda for the developing countries is to increase investment in formal

UNIT BASIC LIBRARY
103833
Date

education, particularly female education (Caldwell, 1982; Cochrane, 1983; Bicego and Boerma, 1993). In fact, the 1994 International Conference on Population and Development (ICPD) in Cairo has strongly recommended that all countries should take immediate steps to achieve the goal of universal primary education before the year 2015, and to ensure that girls and women should get the widest and earliest possible access to secondary and higher levels of education (McIntosh and Finkle, 1995; Knodel and Jones, 1996). It is argued that about 75 per cent of 960 million illiterate persons in the world are women. India is one of the best examples of such a country with sex disparity in literacy rate till the last census, despite research evidences of the important role of female education in regulating demographic transition and other socio-economic parameters.

Besides, several studies have revealed that female education is more important than paternal education in exerting a negative effect on fertility, though the influence of the latter is also significant in certain studies (Murthi *et al.*, 1995). Khongsdier (2003) has summarised the following reasons why female education is expected to reduce birth rates: First, educated women are likely to have more voice with regard to lightening the burden of repeated pregnancies because they have more control over household resources and personal behaviour. Second, educated women are likely to be less dependent on their children as a source of social status and old age security, thereby leading to a reduction in a desired family size. Third, educated women have higher aspirations for the better achievements of their children, which is conducive to a reduction in a desired family size. Fourth, educated women often have a higher age at first marriage, which is in turn affecting fertility rate. Fifth, educated women often have higher rate of adoption of family planning method, despite certain contradictory results.

In North east India, some studies have been carried out on the effect of education on fertility and mortality rates (Khongsdier, 1993; Sengupta and Gogoi, 1995, IIPS and Macro, 2000). In Manipur, Singh (2006) has also observed the inverse relationship between fertility and educational level. However in Meghalaya, Khongsdier (2002) has reported that among the War Khasi, the education has no significant effect on the fertility, after controlling other factors like maternal age and household income.

Economic Condition

The effect of economic condition on fertility has been revealed by many studies (Choudhury, 1988; Lloyd, 1991; Adamchak and Mbizvo, 1994; Verma *et al.*, 1999). Many

studies have indicated that there is an inverse relationship between fertility and occupation and/or economic condition (Thomas and Aiping, 2000; Bhende *and* Kanitkar, 2003). Poston (2000) has suggested that the decline in fertility rate in China and Taiwan has been attributed to higher level of social and economic development. Dasgupta (2000) has also reported that the high fertility rate in Sub-Saharan Africa is the most acute symptom of poverty. Becker (1981) has suggested that the increase in household income owing to an increase in labour productivity would lead to a decline in fertility if the substitution effect were to dominate the income effect. However, there is also considerable literature suggesting that standards of living as reflected in basic measures of social welfare like level of education and health care can be more relevant to fertility than the degree of economic prosperity and modernization (Freedman, 1982; Malhotra *et al.*, 1995). This suggests that there has been controversy among the scholars regarding the relationship between fertility and economic condition (Dasgupta, 2000). For example, Murthi *et al.* (1995) have also suggested that the effect of economic condition is rather slow in comparison with other social variables like education, particularly female education. Many studies in Bangladesh have also indicated that the lower fertility in that country with low per capita income is mainly because of the efficient implementation of family planning programmes (Cleland *et al.*, 1994; Mitra and Nawab, 1994; Chattopadhyay and Goswami, 2007). The United Nations' (UN, 1985) study outlines several conceptual frame works on the relationship between women's employment and fertility. The major finding of the study was that the relationship between women's occupation and fertility appears to be strong in countries at higher levels of socioeconomic development, particularly in countries with strong family planning programs, and where women's status is relatively higher as measured by age at marriage and educational attainment.

In India also, many studies have revealed that fertility rate is higher among the lower income groups than that among the higher ones (Mukhopadhyay, 1981; Choudhury, 1988; Yadav and Yadav, 1999; Das and Goswami, 2004). Similarly, many studies have also revealed that fertility is higher among the agriculturist groups (Bhasin and Bhasin, 1993 and 2000; Verma *et al.*, 1999; Veleti, 2001). However, there are also contradictory results. For example, Kerala recorded the lowest fertility rate in India during the 1980s, though the per capita income in the state was lower than that in many other states. Likewise, according to the National Family Health Survey in 1998-99 (IIPS and Macro,

2000), Mizoram had the lowest the per capita income in Northeast India, but the state had recorded the lowest fertility rates.

With respect to mortality, several studies have revealed the effects of biosocial factors such as household income, education, religion, maternal age, sex, and birth order (Martorell and Ho, 1984; Rutstein, 1984; Amin, 1990; Redaiah and Kapoor, 1992; Kost and Amin, 1992; Nath *et al.*, 1994; Arnold *et al.*, 1998; Wagstaff, 2000; Macassa *et al.*, 2003; Heaton *et al.*, 2005; Andoh *et al.*, 2007). Improvement in socioeconomic status is generally considered to be essential for improvement in children's health condition, thereby reducing infant and child mortality. In other words, Wagstaff, (2000) has revealed that improvement of the health of the poor can lead to reducing the health inequality between the poor and non-poor, and this is the central goal of many internal organizations, including the World Health Organization. Rutstein (2000) has suggested that such a trend in infant and child mortality is no doubt associated with improvement in socio-economic status along with the improvement in a number of factors like nutritional status, environmental health conditions, breastfeeding and the use of health services.

In India, Murthi *et al.* (1995) have suggested that the relationship between mortality and poverty may deserve careful examination. They have observed that the association between poverty and child mortality is rather weak in India. "The question remains whether poverty has a strong effect or mortality or fertility after controlling for other explanatory variables." The general opinion is that infant and child mortality is lower in the higher economic groups as they are able to afford better health care facilities, and they have higher educational standard, thereby becoming more conscious of the health of their children. Thus, although different factors are associated with mortality, the effect of household income has been revealed in many studies (Mosley and Chen, 1984; Pandey and Tiwary, 1993). The above suggestion given by Murthi *et al.* (1995) may be taken into consideration with a view to having a better understanding of the effect of family income on infant and child mortality.

In Northeast India, in the study of among the Lothas of Nagaland it is mentioned that the infant mortality rate decreased with increasing in income level (Maurya *et al.*, 2005). But there has been lack of information about such type of study, except those given by the NFHS (1999) and few researchers (Saikia *et al.*, 2001).

Religion

Several studies have revealed a relationship between fertility and religion (Irudaya Rajan and Rao, 1991; Kollehlon, 1994; Knodel *et al.*, 1999). Studies revealed that Muslims have higher fertility rate and lower use of contraceptives than that of non- Muslims (Choudhury, 1982, Rao *et al.*, 1986; Visaria *et al.*, 1995). However, Swaminathan (2004) has observed that Muslims of Bangladesh have reduced their fertility much faster than even Indian Hindus.

In India, many studies have indicated that among the religious groups, the Christians have the lowest fertility rate, which is followed by Hindus and then followed by Muslims (Ghosh *et al.*, 1983; Irudaya Rajan and Rao, 1991; Sharif, 1999; Iyer, 2002). A study conducted in Slum dwellers of Kolkata Dastidar and Gupta (2000) have observed that, the fertility is higher among the Muslims as compared to the Hindus. The National Family Health Survey (NFHS, 1998-99) has revealed that of the religious groups in India, the Christians have the lowest birth rate, which is followed by Hindus, and it is highest among the Muslims (IIPS and Macro, 2000). The higher fertility rate among the Muslims is believed to be associated with the lower acceptance rate of family planning methods (Khan and Prasad, 1983; Dastidar and Gupta, 2000). Similar observation was made by Gulati, *et al.* (2003) in Delhi. However, Krishnaji and James (2005) do not confirmed the observation that the fertility rate is always higher among the Muslims than that among other religious groups.

In North East India, there is hardly any study on the religious differences in fertility rates. Khongsdier (1993) conducted a study among the War Khasi of Meghalaya and he observed that Christian have higher fertility rate than non Christian. He explained the higher fertility rate of Christian is not because of religious effect, but due to differences in educational attainment.

As far as mortality is concerned, only few studies have revealed the effect of religion on infant mortality. Ewbank *et al.* (1986) have reported that there is no significant difference between the Muslim and the Roman Catholics in respect of mortality rate. It is, however, higher in Muslims than in the Protestants. In India, the NFHS (1998-99) has shown that the infant and child mortality is high among the Hindus, but low among the Christian (IIPS and Macro, 2000). In north eastern region of the country, as study

conducted by Das and Das (1982) among the rural Assamse women revealed that the mortality rate varies even within the same religious group, i.e. the Hindu religion.

ANTENATAL CARE

Many studies have revealed that antenatal care (ANC) is an important aspect of maternal health (MHFW, 1997; Park, 1997; Sugathan *et al.*, 2001; Jain and Parasuraman, 2004; Ram and Singh, 2006) and the World Health Organization has recommended a minimum of 4 antenatal care visits for low risk pregnancy in women (Matthai, 2005). Rooney (1992) has also suggested that many thousands of women could save their lives if appropriate medical care and health management systems were provided. Several studies have also revealed that infant and child mortality rates were also greatly reduced if mothers received antenatal and delivery care (IIPS, 1995; Mohsin, *et al.*, 2006). Jejeebhoy (1997) has observed that women who had at least one antenatal visit had a higher chance of survival compared with those who had no visit. Again, utilization of antenatal care services by women may lead to seek treatment for various complications occurring during pregnancy and after delivery (Sugathan *et al.*, 2001). However, many studies have also showed that the routine procedures constituting antenatal care have a very little influence on maternal mortality and morbidity (McDonagh, 1996; Carroli *et al.*, 2001; Bergsjo, 2001).

Numerous studies have also demonstrated that there is a strong positive relationship between the utilization of antenatal services and the socio-economic backgrounds of mothers in terms of literacy, place of residence (urban and rural) and standard of living (Cleland and van Ginneken, 1988; Sharma *et al.*, 2002; Pathak *et al.*, 2003; Kanungo and Mohanta, 2004; Mutharayappa; 2005). On the other hand, Griffiths and Stephenson (2001) have observed that in Maharastra socio economic status was not found to be a barrier to antenatal services when the service was within reasonable distance. In the following sub-sections, we shall briefly review the role of socioeconomic factors in influencing antenatal care.

Rural-urban setting

Several studies have revealed that urban women have higher rates of in Antenatal care (ANC) visiting than their counterparts in rural areas (Cleland and van Ginneken, 1988;

Kanitkar and Sinha, 1989; Bhatia and Cleland, 1995; Pathak *et al.*, 2003; Nagdeve and Bharati, 2003). Many studies have also shown that the rural-urban differences in antenatal visit is because of the differential impacts of various socio-economic factors such as education, standard of living, religion, availability and accessibility of health care and so on (Das *et al.*, 2001; Rao *et al.*, 2001; WHO, 2003; Susan, 2004; Pierre *et al.*, 2005; Mumtaz and Salway, 2007).

The World Health Organization (WHO, 2003) has reported that women living in urban areas were generally twice as likely as those living in rural areas to report for ANC visit. It has further estimated that urban women (86%) have higher rate of ANC than rural women (65%). Mumtaz and Salway (2007) have shown that the lack of social awareness, poor education and low statuses of women are important factors for less ANC visit in rural women than in urban areas of Pakistan. Geo-qing *et. al.*, (2004) have observed that women staying in urban areas with higher education were more likely to report for ANC than women in rural areas of China. Similar observation was also made by Jamil *et al.*, (1999) in Bangladesh.

In India, NFHS (2005-06) has revealed that the disparity between urban and rural women of India for antenatal care service is pronounced with 74% of urban women having at least three ANC visits compared with 43% of rural women (IIPS, 2007). Nagdeve and Bharati (2003) have suggested that women in rural areas were provided with antenatal care and delivery by less trained persons when compared with mothers in urban areas of Andhra Pradesh. Several studies have also revealed a similar observation in Maharastra (Kausar *et al.*, 1999; Griffiths, and Stephenson, 2001). On other hand, Fernandez *et al.* (2003) have revealed that due to low standards of living in urban slum, rural women (65%) have more ANC visits than urban slum women (50%).

In Northeast India, DHS (1998-99) has revealed that urban women with higher education and better economic status have received more ANC than the rural women (IIPS and Macro, 2000). The rural –urban differences is more pronounced in Meghalaya in which about 56% of urban women have received ANC as compared to 26% of them in rural women. A similar observation was made in Manipur where the rate of ANC in urban women (43.4 %) is much higher than in rural women (28%).

Education

In rural China, women who have primary education are more likely to use formal prenatal care and formal delivery assistance than women with no formal education (Susan, 2004). Similar observation was made by Hotchkiss *et al.* (2002) in rural Nepal. In Egypt, educated women were more likely to have obtained antenatal care than were less-educated women and more likely to have obtained it from a private hospital, while a greater percentage of less educated women obtained it from Maternal and Child Health Centre than from Government or private hospital (Mohammed, 1998). In Bangladesh, Jamil *et al.* (1999) showed that mothers who had completed primary level of education were more likely to be immunized during pregnancy compared to mothers who had no schooling. Many studies have also revealed that besides maternal education, maternal age, parity, ethnicity, exposure to mass media women's status has a significant influence on the demand for and utilization of services (Chandrashekhar *et al.*, 1998; Magadi *et al.*, 2000; Matsumura and Gubhaju, 2001).

Turning to India situation, the Reproductive and Child Health Programme has recommended at least three times of antenatal checkup (Ministry of Health and Family Welfare, 1997; 1998b). NFHS (1998-99) has revealed that literate women have received more antenatal checkups as compared with illiterate women (IIPS and Macro, 2000). It has further revealed that the proportion of births whose mothers received antenatal check-ups from a doctor increases with the rise of educational level. Dabral and Malik, (2005) have reported that educated mothers are more likely to visit antenatal care and use of institutional deliveries among the Gujjars of Delhi. They suggested that illiterate women needed to be educated about the availability and benefits of antenatal check–ups so as to overcome the traditional beliefs that prevent mothers from antenatal care. Bhatia and Cleland (1995) have also observed that education has a strong effect in antenatal visits in South India.

In Northeast India, NFHS (1998-99) has revealed that in every state the proportion of births whose mothers received antenatal check-ups from a doctor increases with increases of mother's education, (IIPS and Macro, 2000). For instance, mothers who have completed at least high school had received more antenatal check-ups for almost all births compared with illiterate mothers. However, little is known about the studies at the population level especially in Manipur. Thus, it is imperative to conduct studies on the

relationship between education and antenatal care among married women at the population level.

Economic condition

Women's economic condition has been suggested to have a significant affect on reproductive health (Midhet, Becker and Berendes 1998). It has been suggested that low income group women often seek care from non professional sources when they had trouble with pregnancy and child birth (Parkhurst and Rahman, 2007). Mumtaz and Salway (2007) have observed that family financial condition was an important determinant of ANC visit in Pakistan. They further examined that women with limited financial resources were likely to give less priority to ANC.

In India, NFHS (1998-99) has revealed that disadvantage socioeconomic groups were less likely to use antenatal health care services than the others (IIPS and Macro, 2000). In Utter Pradesh Bloom *et al.* (1999) have observed that women with higher economic status were more likely to use antenatal care services and safe delivery care. In South India, Bhatia and Clleland (1999) have observed that the effect of economic status on antenatal services was very week in comparison with other factors. Similarly, Griffths and Stephenson (2001) have made a similar observation in Maharastra. Fernandez *et al.* (2003) have suggested that besides economic condition, lack of awareness of the need for antenatal care, fear of hospital, attitude and behavior of the staff were deterrents to accessing health care services in urban slums area.

In Northeast India, NFHS (1998-99) has revealed that the ANC visit increase with the increase of standard of living (IIPS and Macro, 2000). It further revealed that the highest ANC visit is among women with higher standard of living in Manipur (99%) as compared to those with low standard of living (84%). Thus, it is suggested that for improving the coverage of antenatal programmes in these states it requires special efforts to reach to high parity women and women who are socio-economically disadvantage (IIPS and Macro, 2000). However, like in the case of the relationship between education and ANC, little is known about the studies at the population level with respect to the correlation between ANC and economic condition especially in Manipur. Thus, there is an urgent need to conduct studies on the relationship between economic condition and antenatal care among married women at the population level in Northeast India.

FAMILY PLANNING

Family planning means a well-planned family with limited members whose maintenance is possible with available resources and tools and thus builds a healthy individual and nation (Aggarwal *et al.*, 2005). WHO (1971) describe family planning as the best way to control the rapidly and massively growing population. Winikhoff and Sullivan (1987) have suggested that family planning can have an important impact on maternal mortality, although it is not by itself an effective approach to the problem. Trussell and Pebley (1984) have advocated that increased use of contraception lowers the risk of maternal mortality ratio by reducing the proportion of births and by lengthening birth intervals. Likewise, Fortney (1987) observes that family planning is an important factor to control the level of maternal mortality by reducing the number of unwanted pregnancies and by reducing the total number of births. Many studies have shown that highly used of contraceptive methods is one of the factors for declining fertility rate (Gertler and Molyneaux, 1994; Haub and Huong, 2003; Cao, 2007; IIPS, 2007). In Africa, it has been shown that the high rate of fertility is mainly because of low level in the use of contraceptive methods (Dodoo, 2001). Numerous studies have also revealed that socio economic condition such as education, standard of living, availability and accessibility, age at marriage, religion etc. are associated with adoption of contraceptive methods (Bhuyan, 1998; Thang and Huong, 2003; DeBroe *et al.*, 2005; Do and Koenig, 2007; Cao, 2007). We shall briefly review the role of socioeconomic factors in influencing family planning in the following sections.

Rural-urban setting

Several studies have revealed that the adoption of family planning methods is higher in urban areas than in rural areas due to the differences in the socio economic factors such as education, occupations, family size, religion, availability and accessibility of contraception methods (Levine *et al.*, 1992; Bandyopadhyay and Stewart, 1998; Kalita *et al.*, 2002; Thang and Huong, 2003; Sharma *et al.*, 2002; Basu, 2005; Cao, 2007).

In Tunisia and Morocco, Esseghairi *et al.*, (1991) have found that due to lack of sources of the family planning methods like IUD and pill, etc, adoption of family planning methods areas were used less in rural areas than in urban areas. Sturley (1998) has revealed that poor knowledge and misconception are the important reasons for low use of

family planning methods in rural areas as compared to urban areas of Nepal. In Kenya Magadi and Curtis (2003) have also reported that the use of modern contraceptive methods especially long term methods is higher in urban areas than in rural areas. Similarly, the use of contraceptives in Guatemala is higher in urban areas than in rural areas due to lack of knowledge and low socio-economic conditions in rural areas (DeBroe *et al.*, 2005). Omariba (2006) has observed that urban women are more likely to use modern contraceptive methods than rural women of Keniya.

In India, National Family Health Survey (NFHS, 1998-99) has shown that contraceptive use is considerably higher in urban areas (58%) than in rural areas (45%) (IIPS and Macro, 2000). Saavala (1999) has observed that in Andhra Pradesh adoption of temporary contraceptive methods is more common in urban areas than in rural areas. Similar observations were also made by Aggarwal *et al.* (2005) and Bhatia and Cleland (1995) in Jammu and Karnataka respectively. Levine *et al.* (1992) have observed that poor quality of family planning methods and concerns about method problems are important reasons for the non- use of contraceptives in rural Uttar Pradesh.

In Northeast India, NFHS (1998-99) has revealed that in every state the use of contraceptive methods (both modern and traditional) is higher in urban areas than in rural areas (IIPS and Macro, 2000). The difference between rural – urban in the use of any methods is highest in Meghalaya, where about 45% of urban women used contraceptives as compared to 14% in rural women. In Manipur also, the prevalence is higher in urban areas (50%) than in rural areas (36%). It is also observed that contraceptive use increases with the rise of the standard of living index in every state.

Education

Many studies have shown that even after controlling the effects of other factors, education is a key factor influencing contraceptive use (Retherford and Ramesh, 1996; Ramesh *et al.*, 1996). In Guatemala, DeBroe *et al.* (2005) have observed that highly educated women were more likely to use contraception than those with primary and no education women. Similar observation was made by Do and Koenig (2007) in Vietnam. Koc (2000) has also observed that contraceptive methods are 50% lowered among illiterate couples as compared with secondary and highly educated couples of Turkey. Vaessen (1991) has suggested that because of the awareness of side effects of discontinuation of other methods

and late marriage highly educated women were more likely to use Periodic abstinence (PA). This was supported by a study in Bangladesh (Kamal *et al.* 2007). Swar-Eldahab (1993) has observed that a lack of information about the contraceptive methods accounted for the low level of contraceptive use in Sudan.

In India, NFHS-2 (1998-99) has revealed that contraceptive use increases with the increase of educational level (IIPS and Macro, 2000). It is further revealed that educated women who have not completed middle education were more likely to adopt female sterilization as compared to highly educated women. Basu (2005) has observed that in India educated women have also used more traditional methods of birth control very well and efficiently. Singh (2003) and Maurya *et al.* (2005) have also observed that acceptance of family planning method is also higher among higher literate groups in Northern India and Nicobar Island. Due to lack of knowledge among the women's husbands and lack of co-operation from husbands, the contraceptive uses are very low in urban slums of Delhi (Aggarwal *et al.*, 2005). Gautam and Seth (2001) in their study among rural Rajputs and Scheduled castes found that besides providing knowledge and contraceptive methods, education helps in increasing acceptance of family control devices.

In Northeast India, NFHS-2 (1998-99) has revealed that the pattern of use of different contraceptive methods varies substantially by education at the state level (IIPS and Macro, 2000). The survey revealed that the current contraceptive use increases with the rise in educational level of women in every state. In Manipur, educated women who have completed middle school were more likely to use modern methods of contraceptive as compared with high and low educated women and women with high educated women were more likely to use traditional methods of contraceptives as compared with middle and low educated women. In Meghalaya, the use of female sterilization increases with educational level. However in Nagaland, Manipur, Tripura and Mizoram the use of female sterilization declines sharply with increasing of educational level. On the other hand, there is no difference between educational groups of mothers in Arunachal Pradesh. It may also be mentioned that little is known about the relationship between adoption of family planning and educational level at the population level in Northeast India, especially in Manipur.

Economic Condition

Many studies have revealed that due to the policy of monetary compensation paid by the state and lack of availability of other contraceptive methods, many poor people are sterilized in greater numbers than the better off family (Philliber and Philliber, 1985; Robinson and Cleland, 1992). In Bangladesh, low socio economic groups were more likely to adopt sterilization (both male and female sterilization) as compared to high socio economic groups and women who have professional jobs and unskilled jobs are more likely to use periodic abstinence (Kamal *et al.* 2007). In Vietnam, there is a positive association between use of any method and socio-economic conditions in which higher socio economic groups are more likely to use any other method as compared to those in the lower ones (Thang and Huong, 2003; Do and Koing 2007).

In India, NFHS-2 (1998-99) has revealed that female sterilization is the most popular method (IIPS and Macro, 2000). Saavala (1999) has shown that the rate of sterilization for monetary compensation is very low in South India. Chattopadhyay and Ray (2005) have observed that the modern contraceptive method is more prevalence among women with high standards of living in both rural and urban areas of India. They further observed that in Maharastra the non working groups of women are more likely to use modern contraceptives than the working groups. However, the situation is contrast in Tamil Nadu. In Nicobar Island, women who were involved in Government services were also more likely to use birth control method as compared with those house wives (Maurya *et al.*, 2005). In Andhra Pradesh, Rao and Babu (2005) have also observed that employed women were more likely to use methods.

In North east India, NFHS -2 (1998-99) has revealed that the use of contraceptive methods increases with the increases of standards of living (IIPS and Macro, 2000). It further revealed that the gap in contraceptive use by standard of living (SLI) is highest in Meghalaya and lowest in Manipur. In Manipur 37 percent of women in households with low SLI use contraceptive methods as compared with 49 percent of women in households with high standards of living.

SELF REPORTED MORBIDITY

Reproductive morbidity refers to health problems related to reproductive organs and functions, during pregnancy and/or childbearing (Zurayk *et al.*, 1993). It covers both

gynecological and obstetric morbidity as well as related morbidity, such as urinary tract infections, anaemia, high blood pressure and obesity. Gynecological morbidity includes health problems with pregnancy and obstetric morbidity refers to ill health during pregnancy. The common complications during pregnancy and labour are obstructed labour, haemorrhage, eclampsia, infection, and abortion (Pillai, 1993). Mayank *et al.* (2001) have suggested that obstetric practices are also associated with other gynecological morbidities such as vesico-vaginal, fistulae and prolapse. Although there are reports in maternal mortality from developing countries, information on gynaecological and obstetric morbidity is scanty (Mayank *et al.*, 2001). Few studies on gynaecological morbidity have been conducted in India (Bang *et al.*, 1989; Bhatia and Cleland, 1995; Koenig *et al.*, 1998), but community based data on obstetric morbidity are rare (Mayank *et al.*, 2001). Thus, in view of the scarcity of data on maternal morbidity, the World Health Organization's Technical Working Group has recommended that research priority be given to determine the magnitude of obstetric morbidity in developing countries (WHO, 1990a).

Rural-urban setting

Many studies have revealed that urban women with higher education and economic condition were more likely to report obstetric morbidities (self reported morbidities) than in rural women (Mayank *et al.*, 2001; Mutharayappa, 2005; Jain and Parasuraman, 2004). It is suggested that the rural - urban differences in obstetric morbidities are because of the differential impacts of various socio-economic factors such as maternal age, parity, education, standards of living, access of health care, and so on (Bhatia and Cleland, 1995; Misra and Ramanathan, 2002; Monem and Ali, 2006).

In South Africa, Schneider (1998) has observed that rural women have (29%) high reproductive morbidity than in urban women. He further observed that, it was associated with educational level. A similar observation was made in Morrocco where educated women staying in urban areas have less prevalence of incontinence than those in rural areas (Monem and Ali, 2006). Cham *et al.*, (2005) has shown that the high rates of obstetric complications in rural communities of Gambia are due to lack of transportation prolong transportation and poor quality of health care.

In India, the National Family Health Survey (NFHS, 1998-99) has revealed that there are little urban-rural differences in the prevalence of pregnancy related problems (IIPS and Macro, 2000). However, it revealed that both kinds of vision problems and convulsions were more prevalence in rural areas than in urban areas. Kannan (1991) have reported that in Kerela, due to better network and health facilities, the obstetric complication was reported more in rural women than in urban women. On other hand Jain and Parasuraman (2004) have shown that urban women have more prevalence of obstetric morbidities like convulsion, blurred vision and swelling, etc than the rural women of Bihar. Similarly Bhatia and Cleland (1996) have observed that urban women in Karnataka were reported more pregnancy related problems than the rural women.

In Northeast India, NFHS (1998-99) has revealed the prevalence of that pregnancy related problems is highest in Meghalaya and lowest in Nagaland (IIPS and Macro, 2000). It is also observed that excessive fatigue is common in most of the states. However the report did not mention the urban- rural variation. Thus, it is necessary to carry out further studies on the obstetric problems of both urban and rural areas in Northeast India in general and particularly in Manipur where there has been a lack of such studies.

Other factors

A hospital based study among the Indonesians women showed that 93% of the women had at least one or two obstetric complications during their pregnancies and deliveries and which were associated with their age, education and income level (Ronsmans *et al.*, 1997). In China, Feng *et al.* (2005) have observed that the low socio-economic groups of migrant women (0.9%) were more likely to have obstetric problems (eclampsia symptoms) as compared with local women (0.4%). A study conducted by Pan Arab Project for Family Health (PAPFAM, 1999) in four Arab countries has shown that educated women were more likely to report pregnancy problems as compared with the uneducated women (Monem and Ali, 2006). It is further reported that the prevalence of incontinence (leakage of urine) is higher than the prevalence of prolapsein among the pregnant women, and pregnancy problems increased with the increasing of age and parity. Oladepo *et al.* (2005) have observed that due to hypertensive disorders in pregnancy and hemorrhage, 61.1% of women had experienced miscarriages even among young age women of Nigeria.

In India, NFHS-2 (1998-99) has revealed that women with medium or low standards of living were more likely to have pregnancy problems than women with high standards of living (IIPS and Macro 2000). It is further revealed that excessive fatigue (43%) were most common problems among pregnant women. A study conducted by Mayank *et al.* (2001) in the urban slum of New Delhi has reported that the prevalence of reported morbidity during pregnancy is very high with only 4% of women being completely free of any complaint. It is further reported that women with lower education are less likely to report pregnancy problems when compared with their educated counterparts. A study conducted by Das and Shah (2001) among the low socio economic group of urban slum of Gujarat has revealed that 36% of women had experienced different health problems during pregnancies. It is reported that excessive nausea- vomiting was the most common problem. Another study conducted in Karnataka by Bhatia and Cleland (1995) has revealed that educational level, antenatal care visit and personal hygiene were significantly associated with morbidities. They further observed that 28% of the women had reported at least one morbidity during their last pregnancy, 8% of them were having prolonged labour and hemorrhage during delivery and 23% were suffering from infection, hemorrhage and loss of consciousness in the post- partum period. Jain and Parasuraman (2004) have observed that in Madhya Pradesh the low socio economic and illiterate women were more likely to have pregnancy and post delivery complications as compared with literate women. But in Bihar the percentage of women having complications were higher in women with medium standards of living. In rural Tamil Nadu Ravindran (1996) has observed that because of better awareness, literate women were more likely to report pregnancy complication than those illiterate women. A study conducted by Indian Council of Medical Research (ICMR, 1996-97) among the India rural women showed that more than half of the pregnant have mentioned at least one problem (Chandiok, *et al.*, 2006). Sharma and Parthi (2004) have observed that weakness, pain in abdomen, bleeding was more prevalent among the low socio economic group of SC women of Punjab. A similar observation was made in Utter Pradesh by Maitra *et al.* (2001). They further observed that illiterate women were more likely to have reproductive health problems than those literate women. A study conducted by Chopra and Makol (2004) have revealed that due to shyness, lack of interest among family members and monitory problems, 19% of women were having experienced pregnancy problems in Rajasthan. In Kerala, Sowmini

and Sankara Sarma (2004) have observed that the contraceptive users were more likely to suffer reproductive health problems than non acceptors. It is further revealed that a higher proportion of IUD users tended to have these problems as compared to acceptors of the female sterilization procedures.

In North east India, NFHS-2 (1998-99) has revealed that the prevalence of pregnancy problems were more likely higher in lower socio economic women as compared with high socio economic women (IIPS and Macro, 2000). It is further revealed that night blindness and anemia were least prevalence in Manipur and highest prevalence in Meghalaya. Women are less likely to report vaginal bleeding than any other pregnancy problems in every state except in Mizoram. However, little is known about the relationship between obstetric morbidity and socioeconomic aspects at the population level.

NUTRITIONAL STATUS OF WOMEN

Nutritional status is defined as the physical expression of the relationship between the nutrient intakes, or bio-availability of nutrients, and the physiological requirements of an individual (Brown, 1984). It is generally reported that the basic causes of under-nutrition and infections in developing countries are poverty, poor hygienic conditions and little access to preventive and health care (Mitra, 1985; WHO, 1990). Hence, assessment of the nutritional status of population has attracted the attention of not only the nutritionists and other biological scientists, but also the economists and other social scientists with a view to understanding the health and socioeconomic status of the population (Osmani, 1992). Quetelet or body mass index (BMI = weight in kg/height in m^2) and upper arm muscle area are widely used as indicators of the nutritional status of adult individuals and/or populations (James *et al.*, 1988, Ferro-Luzzi *et al.*, 1992; Shetty and James, 1994). It is suggested that the BMI may be more nutritionally than genetically related (Rolland-Cachera, 1993), despite the fact that there is a wide variation between human populations in weight and height (Eveleth and Tanner, 1990; Majumder *et al.*, 1990). Several studies have revealed the association between nutritional status and socio-economic conditions (Loize, 1997; Naidu and Rao, 1994; Visweswara Rao *et al.*, 1990, 1995; Nube *et al.*, 1998; Reddy, 1998; Teller and Yimer, 2000; Girma and Genebo, 2002; Roy, 2006; Shafique *et al.*, 2007).

Rural-urban setting

The effect of socio-economic conditions on the rural – urban differences in nutritional status of women has been revealed by various studies (WHO, 1990; Kennedy and Haddad, 1991; Girma and Genebo, 2002; Kim *et al.*, 2007; Shafique *et al.*, 2007). In Ethopia, studies have shown that rural women are more likely to suffer from chronic energy deficiency than women in urban areas (Teller and Yimar, 2000 and Girma and Genebo, 2002). Shafique *et al.* (2007) showed that urban women have a higher prevalence of over-nutrition than rural women in Bangladesh due to increasing in educational level.

In India, NFHS (1998-99) has shown that nutritional problem is more common in rural women than in urban areas due to more illiterate and low socio economic conditions (IIPS and Macro, 2000). It is also observed that obesity is higher in urban women than in rural women. The prevalence of anaemia is also higher in rural women (54%) than in urban women (46%).

In Northeast India, NFHS (1998-99) has revealed that Arunachal Pradesh (35%) and Meghalaya (26%) were the high prevalence of nutritional deficiency (IIPS and Macro, 2000). This is associated with educational level and standards of living.

Socioeconomic factors

A study conducted by Teller and Yimar (2000) in Ethiopia have showed that women from low economic status and illiterate households were more likely to suffer from malnutrition than those from higher economic status and higher education. They further observed that women in the youngest age group (15-19) and oldest age group (45-49) were most affected by malnutrition. A similar observation was made by Gallus *et al.* (2006) in Itally. A study in Africa showed that women who had greater control over their income were more likely to be nourished than economically dependent women (Kennedy and Haddad, 1991). A recent study has also revealed that the prevalence of overweight and chronic energy deficiency (CED) is emerging among both rural and urban women in Bangladesh (Shafique *et al.*, 2007). They further found that women with higher socio economic and higher educational level were more likely to have overweight as compared with those in lower socioeconomic groups.

In India, NFHS-2 (1998-99) has revealed that women with low socio economic background were more likely to suffer from nutritional deficiency (IIPS and Macro, 2000).

It is further revealed that obesity were more common among women with highly high standards of living. Basu and Mitra (2001) has revealed that because of the lack of proper diet, heavy workload, low socio economic conditions and lack of education, maternal nutrition was quite common among Indian tribes. A similar observation was made by Roy (2006) among Santals of West Bengal. Sahoo and Panda (2006) have observed that in spite of better education and high income, nutrition intake was lower than recommended regular diet allowances (RDA) among the pregnant women of Orissa. In urban slum of Maharastra, about 68% of the expectant mothers were nutritional deficiency due to low socio economic conditions (Fernandez *et al.*, 2003).

In Northeast India, NFHS (1998-99) has revealed that illiterate women and women with a low standard of living were more likely to suffer from nutritional deficiency in every state (IIPS and Macro, 2000). It is further revealed that nutritional deficiency is highest in Tripura (35%) and Meghalaya (26%) and obesity is highest among women of Manipur. The nutritional deficiency was more common among the women with low educational level and low standards of living in Manipur. In a study among the Hmars of Aizwal, it is reported that there is co- existence of under- and over- nutrition depending upon socio economic condition (Varte, 2006).

ANEMIC STATUS OF WOMEN

With respect to nutritional anemia, the WHO Scientific Group (WHO, 1968) has defined nutritional anemia as a "condition in which the haemoglobin content is lower than normal as a result of a deficiency of one or more essential nutrients, regardless of the cause of such deficiency." The WHO Scientific Group has recommended that the normal values of haemoglobin content 12g/dl for adult female and in the case of pregnant women the normal value is 11 g/dl. Anemia may have detrimental effects on the health of women and children and may become an underlying cause of maternal mortality and perinatal mortality. It has also been reported from various studies that anaemia results in an increased risk of premature delivery, still births, spontaneous abortions, perinatal and neonatal mortality and many other health problems (Levin, 1993 and Seshadri, 1997; Allen, 2000; Kaiser and Allen, 2002).

Rural-urban setting

Many studies have reported that the differences between rural and urban areas in respect of hemoglobin level among women are due to nutrition, socio-economic conditions age, sex, etc. (Mathai, 1989; Kapil, 1990; and UNICEF, 1991; Islam *et al.*, 2001). Amengor *et al.* (2005) observed that rural pregnant women are more likely to have low hemoglobin level than urban women in the Sekyere West District of Ghana. In Bangladesh, Islam *et al.* (2001) have reported that anemia and iron deficiency are more prevalent in rural women than in urban women due to low socio economic condition. In fact many studies (Mathai, 1989; Kapil, 1990; and UNICEF, 1991) have revealed that anemia is widespread among pregnant women than non pregnant women and it is higher in rural women (50- 70%) than in urban areas (40-50%). Similarly, the prevalence of anemia in Andhra Pradesh is higher in rural women than in urban women due to poor socioeconomic condition in the former (Bentley and Griffiths, 2003). Similarly, Sahoo and Panda (2006) were made similar observation in pregnant women of Orissa. It has also observed that anaemia is highly prevalent in Meghalaya (63.3%).

Socioeconomic factors

Many studies have also revealed that because of the increased iron requirements during pregnancy, pregnant women are much more vulnerable than non pregnant women in anemia (Bulliyya, 2004 and Lee *et al.*, 2006). Numerous studies have also revealed that the differences in haemoglobin level are associated with nutrition, socioeconomic conditions, age, sex, etc. (Assami *et al.*, 1987; Elvira and Elba, 1991; Stolzfus *et al.*, 1998; Kanungo and Mohanta, 2004; Shaoo and Panda, 2006).

Breyman (2002) has found that the prevalence of anemia among non-pregnant (40%) and pregnant women (35-75%) in developing countries were more higher as compared with non pregnant (18%) and pregnant women (18-20%) of developed countries. In Uganda, Srunjogi *et al.* (2003) have observed that mothers with parity of five and above had a slightly lower haemoglobon level than those with lower parity. They further observed that haemoglobin level was lower among women who had not been supplemented with iron during the antenatal period than those who had received iron supplementation. Assami *et al.* (1987) have observed that among the Algerians women

with low socio economic states were more likely to have anemic as compared with those in high socio economic groups. On other hand, Amengon *et al.* (2005) have observed that economic condition, educational level, religion were not significantly associated with the anemia among the pregnant women in Ghana. However, they further observed that the low parity and young age were commonly associated with maternal anemia.

In India, NFHS (1998-99) has revealed that the prevalence of anemia was more common among younger women than for older women (IIPS and Macro, 2000). It is further revealed that women with high educational level and high standards of living were less likely to suffer from anemia. Roy (2006) has revealed that because of the lack of proper diet, low socio economic conditions and lack of education, anemia was quite common among Santal women of West Bengal. Fernandez *et al.* (2003) have found that about 51.7% of the women had moderate anemic in urban slum area of Maharastra because of low socio economic status. Bharati (1983) has found that females in lower economic groups have higher haemaglobin level than those belonging to the higher economic groups of West Bengal.

In Northeast India little is known about the relationship between haemoglobin content and socio-economic conditions. NFHS-2 (1998-99) has revealed that women with highly educated and higher standards of living were less likely anemic than illiterates and low standards of living (IIPS and Macro, 2000). In Manipur, women who had completed middle school were more likely to be anemic than those with low educational level. Pregnant women were more likely to be anemic than non- pregnant women in most of the states. The prevalence of anaemia among the women was highest in Meghalaya. One study among the War Khasi of Meghalaya has revealed that haemoglobin level is positively associated with the economic levels (Khongsdier, 1997). More studies are needed to carry out among populations in Northeast India in order to understand the nutritional status of the population.

NUTRITIONAL STATUS OF CHILDREN

Nutritional status is a major determinant of the health and well-being of children. Nutritional status refers to the state of health of an individual which is affected by the intake and utilization of nutrients. On other hand, malnutrition is an imbalance between intake and the body's need to ensure optimal growth and function, and this imbalance has

lead to malnutrition in the form of stunting which has a multi-factorial aetiology with a clear association with poverty and poor living conditions (Vella *et al.*, 1992). Thus, malnutrition is often cited as an important factors contributing to high morbidity and mortality among children in developing countries (Bairagi and Choudhury, 1994; Vella *et al.*, 1992). Inadequate intake of protein and other nutrients during the preschool age period had an adverse effect on the child, leading to retardation in both physical growth and mental development (Galler *et al.*, 1990; Stinson, 1998). In the following section we shall briefly review the role of socioeconomic factors in influencing the nutritional status of the children.

Rural-urban setting

Many studies suggested that urban children are nutritional better than rural children (Sommerfelt and Kathrya, 1994; Mitra and Tiwari, 1997; Yimer, 2000) Several studies revealed that some socio-economic factors such as parents' education, household economic status, maternal nutrition, age, sex etc. are important factors for rural- urban differences in influencing the nutritional status of children (Torum *et al.*, 1996; Gaur *et al.*, 2002; Rajaram *et al.*, 2003; Jashwal and Jashwal, 2005; Kennedy *et. al.*, 2005).

In Indonesia, Sekiyama and Ohtsuka (2005) have reported that low socio-economic, poor women's education and lack of adequate health facility are some of the important factors for causing malnutrition in rural children than in urban children. Similar observation was also made by Fotso and Kuate- Defo (2006) in Africa. However, they further observed that socio-economic inequalities in childhood malnutrition are more pronounced in urban centre than in rural areas. Similar observation was made by Kenedy *et al.*, (2005) among the children of Angola, Central African Republic and Senegal.

Turning to Indian situation, NFHS (1998-99) has revealed that undernutrition is substantially higher in rural areas than in urban areas (IIPS and Macro, 2000). Hutter *et al.* (2006) has observed that malnutrition is higher in rural girls than urban girls of Karnataka. Reddy *et al.* (2006) have also explained that variables like backward community, poor housing, low per capita income, nil or small land holding, labour and illiteracy are significantly associated with a high prevalence of under nutrition in rural pre school children of Orrisa. In Kerela and Goa, parental education and standards of living are the important factors for higher nutrition in urban children than in rural children (Rajaram *et al.*, 2003).

In Northeast India, NFHS (1998-99) has shown that under nutrition is highly prevalent in Meghalaya (IIPS and Macro, 2000).It is also observed that the prevalence of under-nutrition is higher among children of disadvantaged socioeconomic groups. Som *et al.* (2006) have observed that due to low standard of living and lack of education in young mothers are factors responsible for higher under- nutrition in rural areas than in urban areas of Assam.

Education

Education is one of the most important resources that enable women to provide appropriate care for their children, which is an important determinant of children's health and well being (Eaagle and Menon, 1996). Behrman and Wolfe (1984) have also suggested that household characteristics, especially female literacy are very important in child malnutrition. Studies in Bangladesh have showed that children of uneducated or primary educated mother's had a higher risk of malnutrition than the children of educated mother (Roy, 2000; Rahman and Chowdhury, 2007).They further observed that father's educational level was also associated with children nutritional status. Many studies in Ethopia have also showed that the prevalence of malnutrition among young children decreases with the increase in mother's educational level (Genebo *et al.*, 1999; Yimer, 2000; Girma and Genebo, 2002).

In India, Malnutrition among the children is prevalent in almost all states of India. NFHS-2 (1998-99) has revealed that the children of illiterate mother were more likely to be undernourished than children of those mothers who have completed at least high school and (IIPS and Macro, 2000). Kanungo and Mohanta (2004) have observed that children from schedule tribes have the poorest nutritional status in India. Roy (2006) has observed that due to lack of awareness of health and nutrition- education, 47.8% of male children and 63.6% of female children were suffered from malnutrition in Santals of West Bengal. Som *et al.* (2006) have observed that the nutritional status of children was inversely related to the level of the educational level of parents in Assam and West Bengal. In Kerala and Goa, Rajaram *et al.* (2003) have observed that children whose parents had stopped schooling below high school were more likely to suffer from under nutrition than children whose parents were highly educated. They further observed that under nutrition of the children in Kerala was varied by educational level of father. Ignorance and lack of

appropriate nutrition knowledge were some of the reasons for the prevalence of malnutrition among the children of Uduipur. (Sankhala *et al.*, 2004).

In Northeast India, NFHS-2 (1998-99) has revealed that children whose mothers were illiterate were more likely to suffer under-nutrition than whose parents had completed the highest level of education in every state except in Meghalaya (IIPS and Macro, 2000). In Meghlaya, children whose mother had completed middle school were more likely to under- nourish than children of low and high literate parents. Rao *et al.* (2004) have also revealed that parental education had a significantly positive impact on the nutritional status of children in every state. Gaur and Singh (2005) have observed that 29% of children were undernourished among the children of rural low backward of Manipur. Varte (2006) has observed that parental educations have less significantly associated with the nutritional status of the children of Hmars of Aizwal.

Economic Condition

The economic status of a household is also one of the most important determinants of child nutritional status (UNICEF, 1990). Many studies have showed that the higher the level of economic status of the household, the lower the level of child under- nutrition (Sommerfelt *et al.*, 1994; Genebo, 1999; Yimer, 2000). In Ethopia, Girma and Genebo (2002) have observed that the children from low economic family were (54%) had higher prevalence of under- nutrition than the children of belonging to the medium/higher economic groups. Giashuddin *et al.* (2005) have suggested that the children of the poorest family were two times higher in malnutrition than those of the richest children of Bangladesh. Kenedy *et al.,* (2005) has suggested that children due to low economic status and incressing of poverty are some of the factors for causing malnutrition in urban slum areas of Angola, Central African Republic and Senegal. Similar observation was also made by Fotso and Kuate- Defo (2006) in Africa.

In India, NFHS -2 (1998-99) has revealed that children from low standards of living were more likely to be undernourished than children with high standards of living (IIPS and Macro, 2000). Many studies have revealed that heavy work load and low standards of living are some of the reasons for mal nutrition among children of tribal communities of India (Basu and Mitra, 2001; Kanungo and Mohanta, 2004; Roy, 2006; Rao *et al.*, 2006; Singh *et al.*, 2007).) Under- nutrition and the prevalence of various

deficiencies were also observed among the children of low economic status of schedule caste of Punjab (Uppal *et al.* 2005). Jaswal and Jaswal (2005) have also observed that children from low economic families were more malnourished than children of high economic family in sub- Himalayan region of India. They further observed that the daily mean intake of energy in children of both low and high income families were below the recommended dietary allowances.

In North east India, NFHS-2 (1998-99) has revealed that children from households with a low standard of living were more likely to suffer from malnutrition in Meghalaya and Tripura (IIPS and Macro, 2000). In Manipur, children with parents from medium standards of living were more likely to be malnourished than those children from high and low standards of living. Similar observation was also found in Arunachal Pradesh, Mizoram and Nagaland. Khongsdier and Mukerjee (2003a and 2003b) have observed that the nutritional status of Khasi children of Meghalaya was greatly influenced by economic condition and by intermixture with other populations. Medhi and Mahanta (2006) have observed that the high prevalence of malnutrition among the children of low economic group of tea workers of Assam was chronic and recent causes.

CHILDREN MORBIDITY AND IMMUNIZATION COVERAGE

Many studies have revealed that morbidity is more prevalent among children 1-2 years (Sunekha, 1989; Kannan 1991; Boerma *et al.*, 1991). Numerous studies also have revealed that child morbidity is associated with the socio-economic conditions such as age of the child, personal or domestic hygiene, level of parental educations, household economic status, place of residence, etc. (Teran, 1991; Bor *et al.*, 1993; Timaeus and Lush, 1995; Prakasam and Narveker, 2005; Taffa *et al*, 2005). Kirkwood and Edmand (2001) have suggested that completion of a full course of immunization before a child's first birthday can prevent serious illness and death. They further suggested that increased immunization coverage in recent decades has led to a substantial reduction in child death. Thus, vaccination plays an important role in determining body resistance against various diseases. On other hand many studies have showed that the rates of immunization coverage was associated with socio-economic conditions (Govindasam and Ramesh, 1997; Howlader and Bhuiyan, 1999; Schellenberg *et al.*, 2002) and there are evidence to suggest

that children in poor families and poor countries were less likely to have vaccinated than children in better- off setting (Gwatkin *et al.*, 2000; Gwatkin and Deveshwar, 2001).

Rural-urban setting

Many studies have revealed that poor access to health services, low vaccination coverage, low level of parental educations and poor economic conditions are some of the factors for higher rate of morbidities in rural children than in urban children (Barrett and Browne, 1996; Howlader and Bhuiyan, 1999; Schellenberg *et al.*, 2002; Ghosh and Shah, 2004; Pokhrel and Sauerborn, 2004). Several studies have revealed that the immunization of children are different in rural and urban areas due to the differences in the socio-economic factors such as parents' education particularly maternal education, occupations, age, sex and poor access to health services, (Kabir and Chowdhury 1993; Govindasamy and Ramesh, 1997; Jamil *et al.*, 1999; Cassell *et al.*, 2006)

In China, Wang (2000) has observed that the prevalence of diarrhea is lower in urban areas due to increasing use of modern sanitation facilities as compared to rural areas. Howlader and Bhuiyan (1999) have observed that neonatal morbidity risks are higher in rural areas than in urban areas of Bangladesh because of the lack of immunizations. Similar observation was also made by Schellenberg *et al.* (2002) in Tanzania. Cassell *et al.* (2006) have observed that urban children has more immunized than in rural children of Gambia. Low parental schooling, small economic status, and female gender were associated with incomplete vaccination in rural areas than in urban areas of Bangladesh (Jamil, *et al.*, 1999)

In India, NFHS (1998-99) has revealed that morbidity rate is higher in rural areas than in urban areas (IIPS and Macro, 2000). Ghosh and Shah (2004) have revealed that rural children (75.3%) have more anemic than in urban children (70.8%) of India. Ravindran (1996) has observed that respiratory diseases and diarrhoeal diseases were more common in rural than urban areas of Tamil Nadu. Visaria and Gumber (1996) have observed that urban children (40-60%) have higher immunized than in rural areas (24-34%) in Maharastra and Gujarat.

In Northeast India, NFHS (1998-99) has revealed that acute respiratory infection (ARI) is more common in rural areas than in urban areas of Arunachal Pradesh and Meghalaya and it is highly prevalent among children of less educated and low

standard of living (IIPS and Macro, 2000). But in other states the differences between rural and urban areas is very small. The prevalence of diarrhea is higher in rural areas than in urban areas in Mizoram, Nagaland and Tripura. However, in Manipur the prevalence is higher in urban areas (20%) than in rural areas (15.4%). Due to poor education and low standards of living the prevalence of fever is higher in rural areas than in urban areas in all states.

Socioeconomic factors

In Ghana, the prevalence of diarrhea varies according to education of the mother and household economic conditions (Tagoe, 1995). It is further observed that the children of educated mother living in houses with toilet facilities were less likely to have diarrhea than children of uneducated or primary education living in houses with no such facilities. A comparative study of urban areas of Egypt, Brazil and Thailand by Timaeus and Lush (1995) have indicated that children from better off households have a lower morbidity and mortality. In Australia, Bor *et al.* (1993) have observed that children with socio-economic disadvantage have a higher rate of health care service utilization, more chronic health problems and poorer dental health. Taffa *et al.* (2005) have observed that the occupation of the mother was significantly associated with child morbidity in slum areas of Kenya. They further suggested that working mothers were more likely to seek medical care than non-working mothers.

In India, NFHS -2 (1998-99) has revealed that the children of educated mothers had lower occurrence of acute respiratory infection (ARI) than other children with lower standards of living (IIPS and Macro, 2000). It is further revealed that children with illiterate mothers, living in low standards of living households, using unpurified water for drinking were more prevalent of diarrhea in India (IIPS and Macro, 2000 and Prakasam and Narvekar, 2005). Mother's education and household standards of living have a positive relation with vaccination coverage (Govindasamy and Ramesh, 1997; IIPS and Macro, 2000). Dabral and Malik (2005) have observed that among Gujjars of Delhi, two-third of the children were fully vaccinated, and maternal education was significantly associated with child immunization. They further observed that diarrhea was more prevalent among the children of illiterate mothers. Other morbidity problems like fever, ARI were less likely to correlate with maternal education. In hilly areas of Northern India,

Bharati *et al.* (2006) have observed that about 76.6% of children were suffering from pneumonia due to lack of social awareness, lack of personal or domestic hygiene, heavy workload and lack of knowledge about child health care. A study conducted by Ravindran (1996) in a rural area of Tamil Nadu has revealed that respiratory diseases and diarrheal diseases were the most common health problems in children under 5 years. It further showed that children of illiterate mothers have a significantly higher incidence of skin diseases and worm infestation when compared to children of literate mothers. Jain *et al.* (2006) have observed that the level of immunization coverage for children were very low in Rajasthan because of lack of awareness. They further revealed that only one third of the eligible children were immunized. Ray *et al.* (2004) have observed that the immunization coverage was good in some parts of West Bengal due to easily available and accessibility of health care facility and good knowledge of awareness of child health care.

In Northeast India, NFHS-2 (1998-99) has revealed that children with high educated or more education and children living in high standards of living have a less prevalence of ARI, diarrhea and fever, and there was positive relationship between mother's literacy and children's vaccination coverage (IIPS and Macro, 2000). It is further revealed that the prevalence of ARI was common in Arunachal Pradesh and Meghalaya. In Manipur, boys were more likely than girls to have suffered from ARI and diarrhea and it is associated with maternal education and household economic conditions. Pukhrambam *et al.* (2005) have observed that the difference in attack rate of measles between vaccinated and non vaccinated children in Manipur was statistically significant. They further observed that a non-vaccinated child was about 2.1 times more prone to develop measles as compared to a vaccinated child.

CHAPTER III

MATERIALS AND METHODS

In this chapter, we shall describe the materials and methods adopted in the present study. These materials and methods are related to those used for collection, analysis and interpretation of data.

DESIGN OF THE STUDY

This study has adopted a cross-sectional method, using a systematic random sampling. The study is designed to compare maternal and child health indicators between rural and urban areas. It is also designed to understand how certain biosocial factors are influencing the health outcomes in both rural and urban areas.

SAMPLING METHOD

The present study was carried out in Imphal West District of Manipur during the months of March to September of 2003. The State of Manipur is inhabited by both tribal and non tribal communities. The tribal communities are divided into Naga and Kuki and the non tribal communities are divided into Meiteis including Lois, Bishnnupriyas and the Pangans (Manipur Muslims) (Zehol, 1998). The present field work was conducted among the Lois in Imphal West District of Manipur, taking into consideration both rural and urban settings. There are eight Loi villages in Manipur valley (TDD, 1994), of which four villages are in Imphal West District.

The data for the present study were collected from three Loi areas (37.5 % of total villages), namely, Sekmai in urban area, Koutruk and Phayeng in rural areas, during the months of March to September of 2003. These three areas were selected according to simple random sampling, using random numbers given by Snedecor and Cochran (1967). According to this sampling method, the list of eight villages and their population in Imphal District was prepared based on the information from the District Gazetteer (TDD, 1994). The table of random numbers given by Snedecor and Cochran (1967) was used for selecting the required number of sample villages. This table of random numbers consists of any digit from 0 to 9, which has an equal chance of being appeared in any position. The

random numbers can be used to select either a single digit, two or more digit numbers depending on the size of the population.

No random sampling was applied for selection of subjects/informants from each of the selected villages due to operational difficulties in the field. An attempt was made to cover 600 households, i.e., about 45% of the total 1330 households in all three selected areas. The study included 625 married women (aged 15-49) who were willing to co-operate with the present work. Table (3.1) shows the socio-demographic characteristics of married women included in the present study. The Table is self-explanatory.

Table 3.1. Socio-demographic characteristics of married women included in the present study

Characteristics	Rural		Urban	
	N = 312	%	N = 313	%
Age groups				
≤ 24	48	15.38	47	15.02
25-29	66	21.15	56	17.89
30-34	68	21.79	61	19.49
35-39	56	17.95	60	19.17
≥ 40	74	23.72	89	28.43
Income groups				
Low	150	48.08	54	17.25
Middle	71	22.76	124	39.62
High	91	29.17	135	43.13
Educational groups				
Illiterate	118	37.82	57	18.21
Primary	64	20.51	90	28.75
Secondary	92	29.49	105	33.55
High secondary	38	12.18	61	19.49
Family Size				
Small (< 5)	111	35.58	102	32.59
Average (5-6)	140	44.87	165	52.72
Large (> 6)	61	19.55	46	14.70
Religion				
Hindu	197	63.14	40	12.78
Non-Hindu	115	36.86	273	87.22

NATURE OF DEMOGRAPHIC DATA

The nature of demographic data collected for the present study was based on those parameters suggested by the World Health Organization Working Group (WHO, 1968; Mahadevan, 1986). These may be briefly described as follows:

Individual records: These included name of informant, age, sex, marital status, relationship to head of the household, date and place at which record was taken, clan, tribe, religion, community affiliation, total number of family members, place of birth, place of residence, etc.

Fertility records: They included pregnancy history of each married woman or mother, present age of mother, approximate age at each conception, total number of live-births, birth order; age, sex and marital status of each offspring.

Mortality records: These included total number of conception, number of dead children, sex, date of birth, age at death, causes of death, if any, number of reproductive wastage (abortions and still- births), etc.

Socio-economic variables: These included occupation, education, monthly and annual income of the household, monthly expenditure of the household, age at marriage, and religion.

The entire demographic data were collected through pedigrees and schedules from all the six hundreds households in the three areas, viz., Sekmai, Koutruk and Phayeng. Information on age, sex, marital status, tribe, religion, occupation, income, education, community affiliation, place of birth, place of residence, etc. was collected from the heads of the households or elder members who were capable of furnishing all the relevant information as per household schedule.

The fertility schedule was completed by filling-in the information on the number of conceptions, number of live births, number of reproductive wastage (abortion and still births), sex, present age, age at death, birth order, etc. from all the ever married women. Pedigrees were also collected for cross-checking of data on reproductive history of the mothers. Sometimes, information given by the mothers was cross-checked from their respective husbands. It may be mentioned that great difficulties were experienced in the assessment of age, particularly that of the elderly women because many of them were not

aware of their real age. Consequently in such cases, the age was estimated with the help of other persons in the household/village, or with reference to local important events and the age of the individuals who looked to be in the same age groups. So, there could be some mistakes, in some cases, in the estimation of age.

DATA ON FAMILY PLANNING

Information about knowledge and use of contraceptive methods were collected from 549 married women (aged 15-45 years) through structured schedules based on those included in the National Family Health Survey-2 (NFHS-2) (IIPS, 2000). The respondents were asked if they had ever used any contraceptive methods (both modern and traditional methods). The users were asked about the types of methods and sources of the methods. The nature and types of data were based on those suggested by the Ministry of Health and Family Welfare (MHFW, 2000), which are as follows:

1. ***Awareness of Family Planning***: These included questions related to knowledge of contraceptives/family planning methods.
2. ***Adoption and methods of family planning:*** These included questions related to adoption of contraceptives and duration of use. The contraceptive methods are classified into *modern* and *traditional* categories. The modern contraceptives methods include pill, intra uterine device (IUD) like copper T, condom, female sterilization and male sterilization. The traditional contraceptives methods include rhythm or safe period, withdrawal, use of herbal medicines, etc.
3. ***Sources of Family methods:*** These included questions about the sources of modern contraceptives methods. The sources are divided into two categories, namely, *Hospital sources* (which included both government and private hospitals) and *Pharmacies and shops*.

DATA ON MATERNAL AND CHILD HEALTH CARE

Data on maternal and child health care were collected through structured schedules similar to those for the National Family Health Survey-2 (NFHS-2) (IIPS, 2000). Information was collected on pregnancy and birth histories, details of antenatal and delivery care received during the last pregnancy for each woman (aged < 45 years).

Information was collected from 549 women on specific problems during their pregnancies and whether they received any antenatal check-ups. Women who received antenatal check-ups were asked about the timing of the first antenatal check-up, the total number of check-ups. In addition, the respondents were asked whether they received tetanus toxoid injection and iron/folic acid tablets or syrup during their visits to antennal care centres. In short, an attempt was made to follow as far as possible those guidelines given by the National Reproductive Health Programme (MHFW, 1997), which are classified as follows:

1. ***Awareness of Antenatal care (ANC)***: These included questions related to knowledge about antenatal care for pregnant women.
2. ***Attended of Antenatal care:*** These included questions about attending and number of ANC visits.
3. ***Stage of Pregnancy at first ANC visit:*** These included questions about the stage of pregnancy at 1st ANC visit, nature of ANC and whether women received iron/folic acid tablet and tetanus injections. The stage of pregnancy are divided into 3 stages, i.e., **first trimester** which is first three months, **second trimester,** i.e., second three months and **third trimester,** i.e., last three months of pregnancy period.

Data on immunization of children (aged 3-7 years) were also collected from the parents with special reference to six preventable diseases, namely tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis and measles. Parents were asked about the availability of the immunization card. If card was available, the dates when the child received vaccinations against each disease was noted down. Parents' report on vaccinations was also recorded although record on the card was unavailable. If the mother could not show a vaccination card, she was asked whether the child had received any vaccinations.

ANTHROPOMETRY (ADULTS)

Following are the anthropometric measurements taken on 625 married women aged 15-49 years wearing light apparel:

1. Weight (Kg)
2. Height (cm)
3. Sitting Height (cm)

In addition to the above measurements, following indices were computed for adult females in order to assess the nutritional status:

1. Body mass index = weight (kg)/height $(m)^2$
2. Cormic index or relative-sitting height = sitting height (cm)/ height (cm)

Quetelet or body mass index (BMI) was used as a measure of the nutritional status of the adult individuals (WHO, 1995). On the basis of data from developed countries, BMI ranges of 25–30 and > 30 kg/m^2 are considered to be indicative of overweight and obesity, respectively (WHO, 1995). However, the WHO has recommended that the individuals with BMI of > 23.0 kg/m^2 should be classified as overweight for the Asian populations (WHO, 2000c). The BMI < 18.5 kg/m^2 was used for classifying the individuals with chronic energy deficiency (CED), i.e., a "steady" underweight in which an individual is in energy balance irrespective of a loss in body weight, or body energy stores (Khongsdier, 2005a). Such a "steady" underweight is likely to be associated with morbidity, or other physiological and functional impairments (Shetty & James, 1994; WHO, 1995), despite certain limitations of BMI as an indicator of body energy stores (Khongsdier, 2005a).

In view of the above, we have classified the nutritional status of the individuals as follows:

Underweight/Undernourished = < 18.5 kg/m^2

Normal = 18.5 – 23.0 kg/m^2

Overweight = > 23.0 kg/m^2

ANTHROPOMETRY (CHILDREN)

The present study of physical group was based on a cross sectional sample of Lois boys and girls aged between 3-7 years. Since the exact dates of births were not available for some children, the age grouping of children is done according to the method suggested by Sen (1994), that is 5 year age group includes children of 4.50 (i.e., 4 years 6 months) to 5.49 (i.e., 5 years 5 months 29 days) years of age, where 30 days = 1 month, and 12 months = 1 year. Following are the anthropometric measurements taken on 409 girls and 391 boys:

1. Weight (Kg)
2. Height vertex (cm)

3. Sitting height vertex (cm)

Besides the above measurements, following are the indices were computed for assessment of the nutritional status of children by following the cut-off points given by the WHO Scientific Group (WHO, 1983, 1995).

1. Weight for height (%)
2. Weight for age (%)
3. Height for age (%)

For assessing the nutritional status of children, we have adopted three anthropometric indices – weight-for- age, height-for-age and weight-for-height - which are considered as the indicators of nutritional status. These indices were derived as a standard deviation (SD) or Z-score of a child's measurement to the median weight of the international standard or reference, i.e., the growth reference of the WHO/US National Centre for Health Statistics (WHO, 1983, 1995). The Z-score of - 2 is generally considered as the cut-off point for screening the individuals who are likely to be malnourished. The formula for SD or Z-score is as follows:

Z = (Child's measurement – Reference median) ÷ Reference SD

where

Child's measurement = height or weight of a given child at age X

Reference median = mean or 50^{th} percentile of the reference population at age X

Reference SD = standard deviation of the reference population at age X

METHODS OF TAKING MEASUREMENTS

Standard techniques of measurements described by Weiner and Lourie (1981) and Sen (1994) were followed while taking the anthropometric measurements of children. These may be briefly described as follows:

Weight

The body weight was taken with a spring weighing machine, asking the subject to stand on it with an erect posture and light apparel. The weighing machine was checked from time to time with a known standard weight. No deduction was made for the weight of light apparel while taking the final reading.

Height

It measures the vertical distance from the floor to the vertex. The subject was made to stand as erect as possible with his/her arms hanging at the sides with thumbs forward, heels holding together and eyes directing towards the horizon. The anthropometer was placed at the back and between the heels of the subject, taking care that it is kept absolutely vertical. The sliding sleeve of the anthropometer was then lowered down towards the middle of the head (Sagital line) so that it would touch the vertex lightly. Reading in centimetre and its fractions was recorded.

Sitting height

It measures the vertical distance from the vertex to the sitting surface of the subject. The subject was made to sit on the stool, or a flat wooden chair, or at the end of wooden bench. Then he/she was positioned in an erect sitting posture, with ankles crossed, knees spread about 20 cm apart and hands rested on the thighs. The anthropometer was placed at the back and between the two buttocks, taking care that the lumbar curve of the subject was not flattened, but concave from behind. The sliding sleeve was then lowered down to touch the vertex lightly.

HAEMOGLOBIN ESTIMATION

Data on haemoglobin content of 580 adults were collected using Sahli's Haemometer by following standard techniques (WHO, 1980), which may be described as follows:

1. 3 to 4 ml or 3 g/dl of N/10 HCL was taken in the clean graduated tube or measuring tube.
2. The blood sample was taken directly from the subject after piercing his/her left middle finger tip. Sahli's pipette with mouthpiece was used for drawing or sucking the capillary blood up to 0.02 ml of the pipette. After drawing the capillary blood up to the desired mark, the outside of the pipette was wiped out with absorbent or filter paper, making sure that the blood was still on 0.02 ml mark.
3. The blood was then blown from the pipette into the graduated tube containing N/10 HCL. The mixture was shaken thoroughly and allowed to stand for five minutes or so within the Sahli's haemometer.

4. After 5 minutes or so, two or three drops of distilled water were added to the mixture with the help of dropping pipette. Special care was taken that the blood was thoroughly diluted by tiring it with the glass rod.
5. Seeing that the mixture had changed its colour, care was taken by adding drop by drop of distilled water after stirring it thoroughly. Reading was recorded when the colour of the mixture matched with those of the two reference tubes in the haemometer.

Precautions

1. All apparatus were cleaned thoroughly.
2. The first drop of the capillary blood was avoided for taking the measurement.
3. Care was taken not to allow air bubbles to enter Sahli's pipette before sucking or drawing the blood from the middle finger tip of the subjects.

DATA ON MORBIDITY

Data on morbidity were based on "self-reported illness experience" of a subject as generally adopted in surveys, which did not involve a clinician (Strickland and Ulijaszek, 1993; Garcia and Kennedy, 1994; Strickland and Tuffrey, 1997). Self-reported morbidity (SRM), is also more preferable from the point of view that a clinical diagnosis involves much time, cost and technical expertise, which are not always possible when carrying out a community-based studies in developing countries including India. Despite its limitations (Sadana, 2000), SRM might be considered to be the second alternative proxy for assessing the morbidity status of populations in developing countries. Nevertheless, the term "morbidity" in this study was defined simply in terms of the number of 'days ill' and /or 'days unable to work' in the last four weeks before the survey. Each subject included in the study was asked whether or not she had been ill at any time in the last four weeks? If the answer was yes, she was asked how many days had she been in bed or unable to work due to illness? A subject who reported at least two days ill was classified as being "ill".

The study was symptom-based in which the symptoms were grouped into five categories as suggested in many studies (Strickland and Ulijiaszek, 1993; Strickland and Tuffey, 1997; Sadana, 2000). These categories are as follows:

(1) ***Menstruation Problems:*** These included irregularity in menstruating schedules, body pain during menstrual period, and those self-reported problems relating to menses.

(2) ***Obstetric morbidity:*** Information on self-reported obstetric morbidity during pregnancy period included cold and fever, vaginal bleeding, urination problems, reproductive tract sepsis, abdominal and pelvic pain, swelling of legs, excessive fatigue, and night blindness and blurred vision.

(3) ***Intestinal disorders***: These included diarrhea, dysentery, worms, and vomiting, vomiting fever, bleeding from stool, stomach pain, and heart pain.

(4) ***Cold/respiratory disorders***: These included cough+ runny nose+ headache, cough+ runny nose headache fever, fever cough, cough alone, swollen glands cold, ear problem, breathing problem, chest pain sore throat, tuberculosis.

(5) ***Others:*** Among children these included sores/boils; fever alone, chicken pox, typhoid, scabies, jaundice, body pain, headache alone, malnutrition, weakness, and other symptoms. Among adult females it also included diabetes, hypertensions, lower back pain, and other health problems.

SOCIO-ECONOMIC CATEGORIES

In the present study, three important socio-economic variables were taken into consideration. These include religion, monthly income of the households and educational level. These socio-economic variables were classified arbitrarily into different groups and/or categories with a view to understanding their influence on demographic characteristics, maternal health and nutritional status of the study population. Our classification may be briefly described as follows:

Income groups: Data on household income were collected directly from the head of the household and they were cross-checked taking into consideration some aspects of socio-economic conditions like housing condition, types of occupation, land holding, and monthly expenditure. The interval estimation based on standard deviation of the per capita monthly income of household was adopted for classifying the three economic groups (Khongsdier, 1997), which is as follows:

Above ($\bar{X}$ + 4SD/√N) = High income group (HIG)

($\bar{X}$ − 4SD/√N) to (Mean + 4SD/√N) = Middle income group (MIG)

Below ($\bar{X}$ − 4SD/√N) = Low income group (LIG)

Where N stands for the number of households and $\bar{X}$ is the average monthly per capita income of the households. In the present study, the average per capita monthly income of the 600 households of both rural and urban populations was found to be Rs.831.50 /-with a standard deviation (SD) of Rs.540.16. Thus, following the above interval method, the households with per capita monthly income of below Rs.743/- were classified as LIG, while the range of Rs.743 /- to Rs 919.02/- were considered as MIG, and those household with per capita monthly income of above Rs.919.02/- were classified as HIG.

Educational Level: The data on educational attainment of individuals in the present study were arbitrarily classified as follows: The category **illiterate** includes those individuals who were unable to read and write and those who had no education but could read or write their names. The individuals who attended school up to standard V were grouped into **Primary** level of education. The individuals with educational level from VI to X standard were grouped into **Secondary level,** and the individuals with educational standard of more X-standard are included in the category of **Higher Secondary level** of education.

Family Size: The family size was classified into three categories. The individuals who lived in a household with less than 5 family members were considered as having a **Small Family Size.** The **Average/Medium Family Size** includes those individuals who lived in a household with 5-6 family members. The individuals who lived in a household with more 6 family members were grouped in the category of **Large Family Size**.

STATISTICAL METHODS

All data were managed and analyzed using SPSS (PC Software), version 10.5, in which the level of significance was set at 5%. The analysis was first carried out to present the basic demographic structure of the Loi population in terms of age, sex and marital status, which were based on household census data. For testing the sex ratios for different age groups, chi-square (χ^2) was used with the null hypothesis of the ideal sex ratio of 1:1. The t-student's test (2-tailed) was used to determine the statistical significance of the

differences between two means like age at marriage, age at first child birth, live-births, surviving children, anthropometric measurements, etc. One-way analysis of variance (ANOVA) was used to test the differences between more than two means by assuming such means as independent. For example, the differences among three income groups with respect to live-births, body mass index, etc. One-way analysis of covariance (ANCOVA) was used for testing the null hypotheses about the effects of factor variables on the means of various groupings of a joint distribution of dependent variables. For example, the live-birth means of various educational groups may be affected by other factors like income, age at marriage, occupation, etc. ANCOVA was used in order to control or adjust these factor variables known as covariates. The GLM multivariate analysis of the SPSS package was used for carrying out these tests by coding the different groups..In the present study, the biological/health and socio-economic groups are classified and coded in ascending order. For example, the ages of mothers were classified into six age groups, namely, ≤ 24, 25-29, 30-34, 35-39, 40-44 and 45-49 years. These six age groups were coded as 1, 2, 3, 4, 5 and 6, respectively. For *educational groups*, the mothers are grouped into four educational groups, that is, those who are illiterate, primary, secondary and higher secondary as defined above. These four educational groups were coded as 1, 2, 3 and 4, respectively. As for *income groups*, the three groups, namely, low, middle and high income groups were coded as 1, 2 and 3, respectively. With respect to dichotomous variable like adoption of family planning methods, mothers who adopted family planning methods were coded 1 and those who did not adopt family planning methods were coded as 0. In this way, the different groups were given with different dummy numbers. Depending on the individual scores, the code numbers were given accordingly.

Multiple regression analysis was also used to estimate the coefficients of the linear equation, involving one or more independent variables that best predict the value of the dependent variable. For example, we may predict a number of live-births (the dependent variable) from independent variables such as age, education, income level, etc. However, in the present study we are interested in testing whether the coefficient regression (B) is significant or not after taking into consideration more than one independent variable.

Logistic regression was also used for situations in which we want to predict the presence or absence of a characteristic or outcome based on values of a set of predictor variables. It is similar to a linear regression model but is suited to models where the

dependent variable is dichotomous. For example, adoption of family planning methods (dependent variable) may be associated with maternal education (independent variable). Using logistic regression analysis, we can predict whether or not adoption of family planning methods depends on maternal education by also adjusting for the effects of age, income level and religion as other independent variables. Depending on the types of models, logistic regression is useful for many ways. In the present study, logistic regression coefficients were also used to estimate odds ratios for each of the independent variables in the model.

CHAPTER IV

Maternal Health and Nutritional Status

In this chapter, we shall analyze and describe our data on reproductive health in terms of maternal health among the married women who are in the reproductive-age group 15- 49 years. Since reproductive health is a very vast concept (see page 1), we shall restrict our analysis to certain selected health indicators generally adopted in anthropological study. These indicators of maternal or reproductive health include demographic variables (such as, age at marriage, age at first child birth, fertility, and reproductive wastage), nutritional anthropometry, anemia, antenatal care, delivery characteristics, adoption of family planning methods and self-reported morbidity. An attempt will be made to correlate these indicators with various biosocial factors to understand the reproductive health in the Loi population.

AGE AND SEX STRUCTURE

Table 4.1 shows the total population of the rural and urban areas by age and sex groups. About 44.36%, 51.12% and 4.61% of the populations in the rural areas belong to the age groups 0-14, 15-49 and $\geq$ 50 years respectively and in urban area these frequencies are 43.32%, 52.69% and 4.13%, respectively. According to Sunbarg's classification of population, a population is said to be *progressive* when the number of persons in relation to the total population are 40.00%, 50.00% and 10.00% in the age groups 0-14, 15-49 and $\geq$ 50 years, respectively. The population is referred to as *stationary* if these frequencies are 33.00%, 50.00% and 17.00% respectively; while the frequencies of 20.00%, 50.00% and 30.00%, respectively, are the characteristics of *regressive* population (Khongsdier 2001). Thus, both rural and urban areas the population may be categorized as *progressive* types.

Table 4.1. Age, sex and total population in both rural and urban areas

Age groups (years)	Rural			Urban		
	Male	Female	Total	Male	Female	Total
0-4	106	104	210	104	109	213
5-9	146	149	295	145	140	285
10-14	113	113	226	107	106	213
Total (0-14)	365 22.14%	366 22.20%	731 44.36%	356 21.70%	355 21.63%	711 43.32%
Sex Ratio (0-14)	99.72 males per 100 females $\chi^2 = 0.01$, $p > 0.05$			100.28 males per 100 females $\chi^2 = 0.001$, $p > 0.05$		
15-19	80	66	146	70	77	147
20-24	61	80	141	57	77	134
25-29	62	75	137	71	69	140
30-34	79	68	147	66	64	130
35-39	56	56	112	54	61	115
40-44	50	38	88	63	51	114
45-49	33	38	71	45	38	83
Total (15-49)	421 25.55%	421 25.54%	842 51.12%	426 26.05%	437 27.30%	863 52.69%
Sex Ratio (15-49)	100 males per 100 females			97.48 males per 100 females $\chi^2 = 0.001$, $p > 0.05$		
50-54	21	21	42	16	13	29
55-59	9	9	18	8	5	13
≥ 60	3	12	15	10	15	25
Total (≥ 50)	33 2.02%	42 2.63%	75 4.61%	34 2.17%	33 2.03%	67 4.13%
Sex Ratio (≥ 50)	78.57 males per 100 females $\chi^2 = 1.08$, $p > 0.05$			103.3 males per 100 females $\chi^2 = 0.014$, $p > 0.05$		
Grand Total	819 49.70%	829 50.30%	1648 100%	816 49.73%	825 50.27%	1641 100%
Overall sex ratio	98.79 males per 100 females $\chi^2 = 0.06$, $p > 0.05$			99.76 males per 100 females $\chi^2 = 0.99$, $p > 0.05$		

In the age group 0-14 years, the sex ratios are respectively 99.72 and 100.28 males per 100 females in rural and urban areas. In comparison with the ideal sex ratio of 1:1, the sex ratio in rural area is low, whereas the sex ratio in urban area is by and large similar to the ideal sex ratio. However, the chi-square test indicates that the sex ratio in rural area does not deviate significantly from the ideal ratio in this age group ($\chi^2 = 0.01$, df = 1, $p > 0.05$). There are also no significant difference between rural and urban areas ($\chi^2 = 0.21$, df = 1, $p > 0.05$).

In the age group 15-49 years, the sex ratio in rural area is exactly ideal sex ratio of 1:1 and in urban area the sex ratio is 97.48 males per 100 females, which is low in comparison with the ideal sex ratio of 1:1. However, the chi-square test indicates that sea ratio in urban area does not deviate significantly from the ideal ratio in this age group (χ^2 = 0.001, df = 1, p > 0.05).

The sex ratios in the age group ≥ 50 years are found to be 78.57 and 103.3 males per 100 females in rural and urban areas, respectively. The sex ratio in this age group is very low especially in rural areas. However, the chi-square test suggests that the deviation from the ideal sex ratio is not significant for both rural (χ^2 = 1.08, df = 1, p > 0.05) and urban (χ^2 = 0.014, df = 1, p > 0.05) areas. This may be due to the effect of population size in this age group, i.e., the number of males and a female is small in this age group (Table 4.1).

The population pyramid of rural and urban areas (Fig 4.1) depicts that the base is narrow indicating low rate of fertility, perhaps due to practice of family planning methods in recent times. The longevity after 50 years of age seems to be higher in females in rural areas, despite the absence of statistical difference. On the other hand, the longevity in urban areas is slightly higher in males than in females.

MARITAL STATUS

Table 4.2 shows the marital status of both males and females in both rural and urban areas. Of the married males, 6.0% and 3.84% belong to the age group 24 years and below in the rural and urban areas respectively. It indicates that the rural males get married earlier than their urban counter parts, although it is not statistically significant (χ^2 =1.58, df =1 p < 0.05). With respect to the married females, Table 4.2 shows that about 14.54% of them in rural area and 14.37% of them in urban area got married at the age of 24 years and below. It reveals that there is not much difference between rural and urban areas in respect of the proportion of females who are married at the age of 24 years and below. However, the mean age at marriage is significantly higher in the urban women than in the rural women (Table 4.3).

Figure 4.1

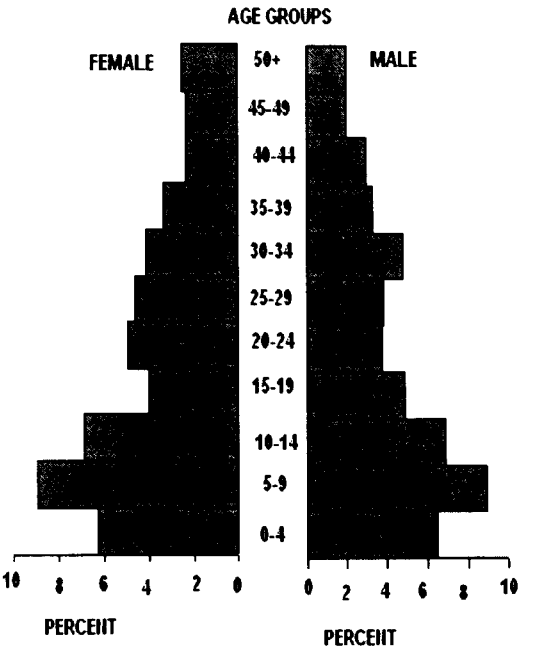


FIG 4.1: POPULATION PYRAMID (RURAL)

Figure 4.2

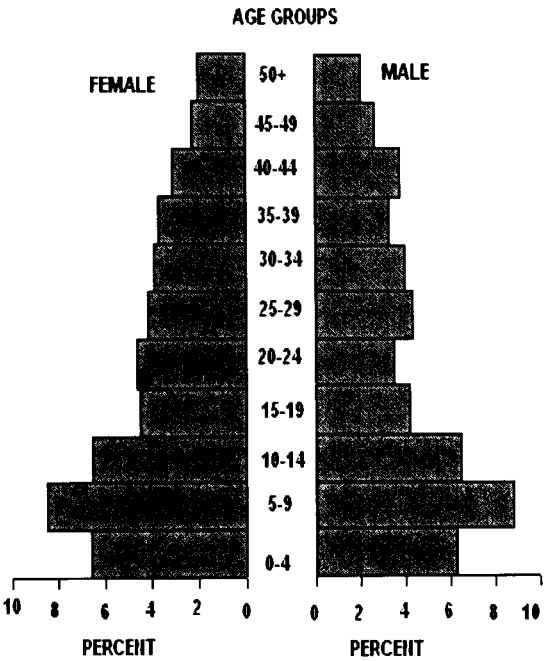


FIG 4.2: POPULATION PYRAMID (URBAN)

Table 4.2. Marital status of the individuals by present age groups

Marital Status by age groups	Rural		Urban	
	Male	Female	Male	Female
≥ 24 years				
Married	19 (6.10%)	48 (14.54%)	12 (3.84%)	47 (14.37%)
Unmarried	487	464	471	461
DSW	0	0	0	0
25-29 years				
Married	47(14.96%)	66 (20.00%)	53 (16.98%)	56 (17.12%)
Unmarried	15	9	18	13
DSW*	0	0	0	0
30-34 years				
Married	78 (24.84%)	66 (20.00%)	60 (19.23%)	58 (17.73%)
Unmarried	1	0	6	3
DSW*	0	2	0	3
≤35 years				
Married	170 (54.14%)	150	187	166 (50.76%)
Unmarried	0	(45.45%)	(59.93%)	2
DSW*	2	2	1	16
		22	8	
All age groups	819	829	816	825
Married	314	330	312	327
Unmarried	503	475	496	479
DSW*	2	24	8	19

*DSW = Divorced, separated and widowed
Figures within parentheses indicate percentages

MEAN AGE AT MARRIAGE

Table 4.3 shows the mean age at marriage for both males and females in both rural and urban areas. It shows that the mean age at marriage in urban women (21.87±0.27 years) is higher than in rural women (20.95±0.23 years). The t-test also indicates that the difference between rural and urban women with respect to mean age at marriage is statistically significant ($t = 2.59$, $p < 0.05$). The mean age at marriage among males is also higher in urban (24.88±0.41 years) than in rural (23.91±0.25 years) areas. However, the difference is not statistically significant ($p > 0.05$). Nevertheless, we may conclude that the mean age at marriage is higher in urban than in rural areas especially among females. This may be due to many factors especially schooling and awareness of family planning which are supposed to be higher in urban than in rural areas.

Table 4.3. Mean age at marriage for males and females

Sex	Rural			Urban			t-value(2-tailed)
	N	Mean	SE	N	Mean	SE	
Males	312	23.91	0.25	313	24.88	0.41	1.10, $p > 0.05$
Females	312	20.95	0.23	313	21.87	0.27	2.59, $p < 0.05$

MEAN AGE AT MARRIAGE FIRST CHILD BIRTH

Table 4.4 shows the mean age at first child birth among married men and women for both rural and urban areas. Like in the case of mean age at marriage, the mean age at first child birth is higher in urban women (23.60±0.27 years) than in the rural women (22.85± 0.21 years), and it is statistically significant ($t = 2.27$, $p < 0.05$). The same is true for the married men. It is observed that the mean age at first child birth is higher in urban men (26.66±0.29 years) than the rural men (25.88±0.27 years). The difference is found to be statistically significant ($t = 2.08$, $p < 0.05$).

Table 4.4. Mean age at first child birth

Sex	Rural			Urban			t-value (2-tailed)
	N	Mean	SE	N	Mean	SE	
Males	312	25.88	0.27	313	26.66	0.29	2.08, $p < 0.05$
Females	312	22.85	0.21	313	23.60	0.27	2.27, $p < 0.05$

FERTILITY

Live-births by age group of all married women

Table 4.5 shows the live-births by age groups of married women of all ages. The mean numbers of live-births per mother is slightly higher in rural mothers (2.61 ± 0.09) than in urban mothers (2.50 ± 0.85). Nevertheless, the t-test indicates the rural-urban difference in live-births is not statistically significant ($t = 0.896$, $p > 0.05$). Among rural mothers, the mean numbers of live-births per mother are 1.00±0.12, 1.79±0.13, 2.69±0.16, 3.11±0.194, 3.64±0.28, and 4.24±0.27 in the age groups ≥24, 25-29, 30-34, 35-39, 40-44, and 45-49, respectively. On the other hand, the mean numbers of live-births among urban mothers are 1.26±0.141, 1.95±0.152, 2.44±0.159, 2.68±0.172, 2.84±0.207 and 4.18±0.226 respectively. The one way of analysis of variance (ANOVA) indicates that there are highly

significant differences between the age groups of mothers in respect of live births for both rural ($F = 35.95$, $p < 0.000$) and urban (F- ratio = 25.69, $p < 0.000$) areas. Thus, it indicates that the mean number of live-births increases with the advance in age of mothers for both rural and urban areas. The coefficient of correlation is also positively significant for both rural ($r = 0.602$, $p < 0.01$) and urban ($r = 0.517$, $p < 0.01$) areas. However, the differences between rural and urban areas in respect of live-births for different age groups are significant only in the age group 40-44 years ($t = 2.30$, $p < 0.05$). Overall, there are no significant differences between urban and rural areas in respect of live-births. Pooling the data together for rural and urban areas, the mean number of live-births per mother of all ages is 2.56±0.06.

Table 4.5. Live-births by age group of all married women

Age group (yrs)	Rural			Urban			t-value (rural-urban difference)
	Number of mothers	Mean live-births	SE	Number of mothers	Mean live birth	SE	
≥24	48	1.00	0.129	47	1.26	0.141	1.409, $p > 0.05$
25-29	66	1.79	0.134	56	1.95	0.152	0.789, $p > 0.05$
30-34	68	2.69	0.163	61	2.44	0.159	1.097, $p > 0.05$
35-39	56	3.11	0.194	60	2.68	0.172	1.658, $p > 0.05$
40-44	36	3.64	0.279	51	2.84	0.207	2.302, $p < 0.05$
45-49	38	4.24	0.273	38	4.18	0.226	0.169, $p > 0.05$
Total	312	2.61	0.095	313	2.50	0.085	0.896, $p > 0.05$
F- ratio = 35.95, $p < 0.000$ Coefficient of correlation (r) = 0.602, $p < 0.01$				F- ratio = 25.69, $p < 0.000$ Coefficient of correlation (r)= 0.517, $p < 0.01$			

Mean number of live-births per mother of all ages = 2.56 ± 0.06

Surviving children by age group of all married women

Table 4.6 shows the mean number of surviving children per married woman or mother of all age groups in both rural and urban areas. Overall, the mean surviving children per mother of all ages for both rural and urban areas is 2.48±0.06. Like in the case of live-births, the mean number of surviving children of per mother is by and large similar in both rural (2.52±0.09) and urban (2.43±0.08) areas. It is observed that the mean number of

surviving children per mother increases with the increasing age of the mothers in both rural and urban areas. Among rural mothers, the mean number of surviving children are 1.00±0.12, 1.74±0.13, 2.57±0.16, 3.02±0.18, 3.50±0.27 and 4.05±0.28 in the age groups ≥ 24, 25-29, 30-34, 35-39, 40-44, and 45-49, respectively. These mean numbers are 1.19±0.14, 1.93±0.16, 2.43±0.161, 2.63±0.17, 2.75±0.21 and 3.97±0.24, respectively among urban mothers. The one way of analysis of variance (ANOVA) indicates that there are highly significant differences between the age groups of mothers in respect of surviving children (for rural F= ratio, 33.90, $p < 0.000$ and urban 22.58, $p < 0.000$). Also the co-efficient of correlation shows positively significant (rural, $r = 0.592$, $p < 0.01$ and urban, $r = 0.493$, $p < 0.01$). Thus, it indicates that the mean number of surviving children per woman increases with the advance in age as observed in the case of live-births. The differences between rural and urban mothers in respect of live-births are significant only in the age group 40-44 years. Thus, the present study failed to find out significant differences between rural and urban mothers in respect of fertility of the present population.

Table 4.6. Surviving children by age group of all married women

Age group (yrs)	Rural			Urban			t-value (2-tailed)
	Number of mothers	Mean surviving children	SE	Number of mothers	Mean surviving children	SE	
≥24	48	1.00	0.119	47	1.19	0.138	1.042, $p > 0.05$
25-29	66	1.74	0.134	56	1.93	0.155	0.927, $p > 0.05$
30-34	68	2.57	0.157	61	2.43	0.161	0.622, $p > 0.05$
35-39	56	3.02	0.183	60	2.63	0.171	1.557, $p > 0.05$
40-44	36	3.50	0.266	51	2.75	0.211	2.208, $p < 0.05$
45-49	38	4.05	0.277	38	3.97	0.237	0.219, $p > 0.05$
Total	312	2.52	0.091	313	2.43	0.084	0.726, $p > 0.05$
F-ratio = 33.90, $p < 0.000$ Coefficient of correlation (r) = 0.592, $p < 0.01$				F-ratio = 22.58, $p < 0.000$ Coefficient of correlation (r) = 0.493, $p < 0.01$			

Mean number of surviving children per mother of all ages = 2.48 ± 0.06

Age-specific marital fertility rate (ASMFR) by all married women

Table 4.7 shows the age-specific marital fertility rate (ASMFR) among the mothers of both rural and urban areas. It is seen that ASMFR reaches its highest peak (rural = 0.84

and urban = 0.85) when the mothers are aged 25-29 years; then it starts decreasing with the rise in age of the mothers (Figure 4.3). The total fertility rate (TMFR), that is the sum of the age specific fertility rates, is slightly lower in the urban mothers (3.87) than in rural ones (3.98). Pooling together for both rural and urban areas, the TMFR is 3.91. This total fertility rate for both rural and urban areas is higher than that (3.04) for the whole state of Manipur (IIPS, 2000).

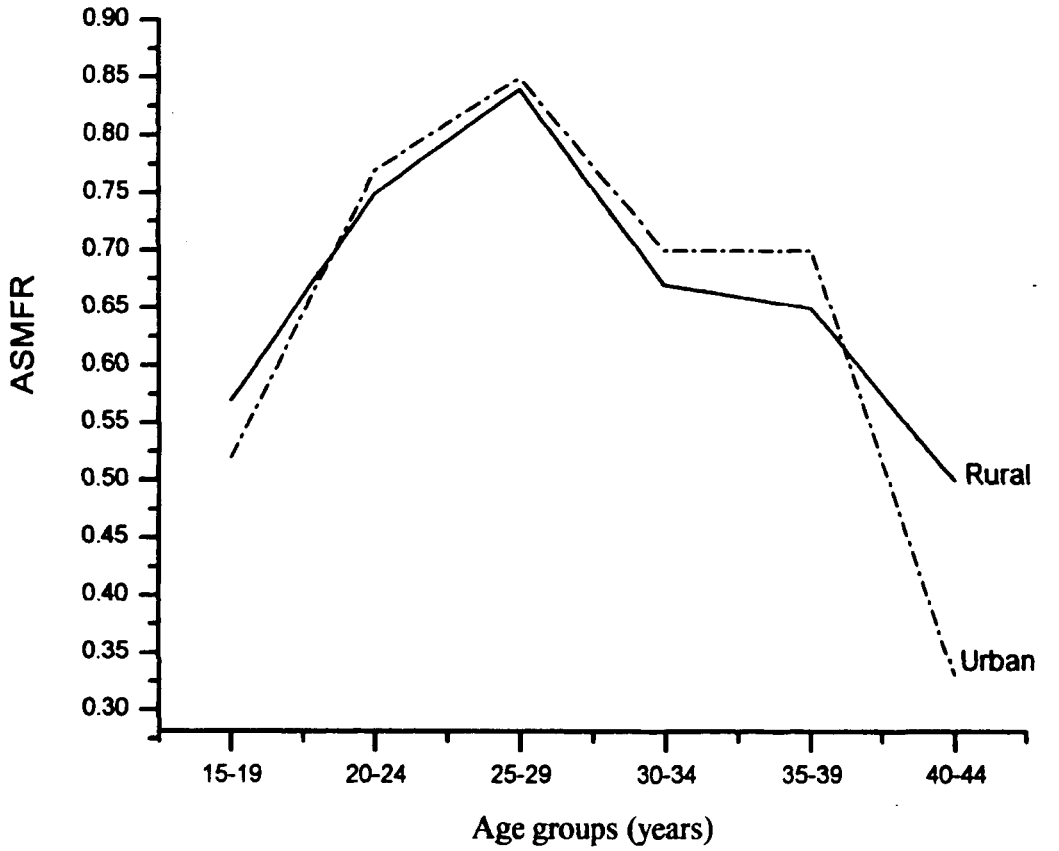
Table 4.7. Age-specific marital fertility rate (ASMFR) to all married women

Age group (years)	Rural			Urban		
	No of married women	Number of live birth	Age Specific Fertility Rate	No of married women	Number of live birth	Age Specific Fertility Rate
15-19	23	13	0.57	29	15	0.52
20-24	133	100	0.75	115	88	0.77
25-29	158	132	0.84	136	116	0.85
30-34	67	45	0.67	77	54	0.70
35-39	17	11	0.65	40	28	0.70
40-44	2	1	0.50	3	1	0.33
45-49	0	0	0.00	0	0	0.00
TMFR*			3.98			3.87

*TMFR = Total marital fertility rate = 3.91 for both rural and urban areas

Figure 4.3

Fugure 4.3. Age-specific marital fertility rates (ASMFR)



REPRODUCTIVE WASTAGE

The prevalence of reproductive wastage among the Lois of the present study is given in Table 4.8. It is found that the still birth rate (i.e., number of still births per 100 pregnancies) is 2.18 % (rural) and 1.22% (urban), whereas the abortion rate (i.e., number of abortions per 100 pregnancies) for rural and urban are 4.14% and 3.66%, respectively Thus, the rate of reproductive wastage (i.e., number of abortions and still births per 100 pregnancies) is 6.32% in rural and 4.88% in urban areas, giving an overall rate of 5.62%. It may be noted here that all the reported abortion cases in the present study refer to both spontaneous and induced abortions.

Data on infant and juvenile mortality rates will be given in the next chapter. The reason is that we consider these variables as indicators of the nutritional and health status of the children in the present population. On the other hand, reproductive wastage may be considered as indicator of maternal health status.

Table 4.8. Reproductive Wastage

Variables	**Rural**	**Urban**
Number of mothers	312	313
Number of pregnancies	870	820
Number of spontaneous abortions	29	17
Number of induced abortions	7	13
Total number of abortions	36	30
Number of still- births	19	10
Abortion rate (%)	4.14%	3.66%
Spontaneous abortion (%)	3.33%	2.07%
Induced abortion (%)	0.80%	1.59%
Still-birth rate (%)	2.18%	1.22%
Rate of reproductive wastage (%) (i.e., abortion and still- birth rate)	6.32%	4.88%

Overall rate of reproductive wastage = 5.62%

LIVE-BIRTHS AND SOCIOECONOMIC FACTORS

In this section, we shall analyze our data on fertility in terms of live-births. We shall take into consideration certain demographic and socio-economic factors, which may be correlated with live-births.

Live-births and Age at Marriage

Table 4.9 shows the adjusted and unadjusted number of live-births by three age groups at marriage of women. Since there were no significant differences in live-births between rural and urban areas, the data were pooled together to find out the effects of age at marriage and other socio-economic factors. The analysis of variance (ANOVA) and covariance (ANCOVA) were used for determining and adjusting the differences in mean live-births. The Table shows that the unadjusted mean live-births to women who married at the age of $\geq$ 24, 24-29 and $\leq$ 30 years are 2.91±0.10, 2.69±0.11 and 1.76±0.11, respectively. It indicates that the mean number of live-births decreases with the increase in mean age at marriage as theoretically expected. These differences are highly significant ($F = 27.47$, $df = 2, 622$, $p < 0.0001$). The higher mean live-births in mothers with lower age at marriage as compared to those with higher age at marriage are statistically significant even after adjusting for mother's age, maternal education, paternal education, adoption of family planning, household income and religion ($F = 39.72$, $df = 2, 622$, $p < 0.0001$). This indicates that age at marriage is very important in regulating fertility rate in the present population.

Table 4.9. Adjusted and unadjusted number of live-births by age at marriage of mothers

Age at marriage (years)	Number of mothers	Mean number of live-births per married woman			
		Unadjusted		Adjusted*	
		Mean	SE	Mean	SE
$\geq$ 24	244	2.91	0.10	2.89	0.08
25-29	234	2.69	0.11	2.70	0.08
$\leq$ 30	147	1.76	0.11	1.77	0.10
F-statistics		27.47, $p < 0.001$		39.72, $p < 0.0001$	

**Adjusted for mother's age, maternal and paternal education, adoption of family planning, household income and religion*

Live-births and Parental Education

The adjusted and unadjusted mean live-births by educational level of mothers are given in Table 4.10. The mothers are divided into four educational groups, that is, those who are illiterate, primary, secondary and higher secondary. It is found that the unadjusted mean of live-births decreases with the increasing educational level of mothers. The differences between educational groups are also statistically significant ($F = 34.56$, $df = 2, 621$, $p < 0.0001$). Adjusting for mother's age, paternal education, adoption of family planning, household income and religion, the differences in live-births between educational groups of mother are still significant ($F = 6.72$, $df = 2, 616$, $p < 0.001$). However, when age at marriage is included in the second model of regression analysis, the differences in live-births between educational groups of mother disappeared ($F = 1.66$, $df = 2, 615$, $p > 0.05$). This indicates that the effects of maternal education on live-births are strongly compounded by maternal age at marriage. However, maternal education is positively correlated with age at marriage ($r = 0.36$, $P < 0.001$), which indicates that the higher the age at marriage, the higher is the level of education among the mothers. Therefore, we may conclude that maternal education, through its affect on age at marriage and adoption of family planning methods, is very important in patterning the fertility rate in this population.

Table 4.10. Adjusted and unadjusted number of live-births by educational level of mothers

Educational level	Number of mothers	Mean number of live-births per married woman			
		Unadjusted		Adjusted	
		Mean	SE	Mean*	SE
Illiterate	175	3.39	0.13	2.84	0.11
Primary	154	2.69	0.12	2.59	0.10
Secondary	197	2.10	0.10	2.54	0.09
Higher Secondary	99	1.78	0.13	2.02	0.13
F-statistics		34.56, $p < 0.0001$		6.72, $p < 0.001$* 1.66, $p > 0.05$**	

**Adjusted for mother's age, paternal education, adoption of family planning, household income and religion*

***Adjusted for mother's age, age at marriage, paternal education, adoption of family planning, household income and religion*

The adjusted and unadjusted means of live-births by educational level of fathers are given in Table 4.11. The Table shows that the unadjusted mean of live-births decreases from 3.51±0.22 for the illiterate fathers to 2.07±0.12 for the fathers with higher secondary level of education. Applying ANOVA test, the differences between educational groups of fathers are also statistically significant ($F = 16.92$, $df = 2, 621$, $p < 0.0001$). However, the differences in live-births according to educational levels of fathers disappeared after adjusting for mother's age, maternal education, adoption of family planning, household income and religion ($F = 1.18$, $df = 2, 616$, $p > 0.05$). This indicates that mother's age, maternal education, adoption of family planning, household income and religion are more important factors than paternal education in controlling the live-births in the present population.

Table 4.11. Adjusted and unadjusted number of live-births by educational level of fathers

Educational level	Number of mothers	Mean number of live-births per married woman			
		Unadjusted		Adjusted*	
		Mean	SE	Mean	SE
Illiterate	63	3.51	0.22	2.66	0.17
Primary	170	2.88	0.12	2.47	0.10
Secondary	237	2.38	0.10	2.65	0.09
Higher Secondary	155	2.07	0.12	2.46	0.12
F-statistics		16.92, $p < 0.001$		1.18, $p = 0.319$	

**Adjusted for mother's age, maternal education, adoption of family planning, household income and religion*

Live-Births and Household Income

Table 4.12 shows the adjusted and unadjusted means of live-births by income group of mothers in the present population. Mothers are grouped into three income groups based on the median of monthly per capita income of the households. It is seen from the Table that the unadjusted mean live-births are 3.02 ± 0.12, 2.54±0.10 and 2.12±0.10 in the low, middle and high income groups, respectively. The one way ANOVA test indicates that these differences are significant ($F = 17.31$, $df = 2, 622$, $p < 0.0001$). The higher mean live-births in the lower income groups as compared to high income groups are statistically significant even after adjusting for maternal age, age at marriage, maternal and paternal

education, adoption of family planning, rural-urban setting and religion ($F = 8.47$, $df = 2, 616$, $p < 0.001$). This indicates that household income is very important in regulating fertility rate in the present population, i.e., the effects of household income on live-births is significant even after adjusting for the effects of other factors mentioned above.

Table 4.12. Adjusted and unadjusted number of live-births by income level

Income groups	Number of mothers	Mean number of live-births per married woman			
		Unadjusted		Adjusted*	
		Mean	SE	Mean	SE
Low	204	3.02	0.12	2.84	0.09
Middle	195	2.54	0.10	2.52	0.08
High	226	2.15	0.10	2.33	0.08
F-statistics		17.31, $p < 0.0001$		8.47, $p < 0.001$	

**Adjusted for mother's age, age at marriage, maternal and paternal education, adoption of family planning, and religion.*

Live-Births and Religion

Table 4.13 shows the unadjusted means of live-births by religious groups of mothers in the present population. It is seen from the Table that the unadjusted means of live-births is by and large similar between Hindus (2.76±0.09) and Non-Hindus (2.52±0.08). In other words, there is no significant difference between Hindus and Non-Hindus in respect of live-births ($F = 0.64$, $df = 1, 623$, $p > 0.05$). Therefore, we may conclude that religion is not so important in influencing fertility rate in the present population.

Table 4.13. Unadjusted number of live-births by religious groups

Religious groups	Number of mothers	Mean number of live-births per married woman			
		Unadjusted		F-statistics	
		Mean	SE	F-ratio	p-level
Hindus	237	2.62	0.10	0.64	0.423
Non-Hindus	388	2.52	0.08		

Live-Births and Adoption of Family Planning Methods

The unadjusted means of live-births by religious groups of mothers are presented in Table 4.14. It is seen that about 41.76% of mothers have adopted family planning methods. As expected, the mean live-births is much lower among the users of family planning methods (including traditional methods) than among the non-users ($F = 94.01$, $df = 1, 624$, $p < 0.0001$). The means are not adjusted because family planning methods are the direct factors that could influence the fertility rate (Bongaarts, 1978). Instead, an attempt has been made to show how more direct factors like age at marriage (Table 4.15) and adoption of family planning methods (Table 4.44) are associated with different demographic and socio-economic factors.

Table 4.14. Unadjusted number of live-births among users and non-users of family planning methods*

Adoption of family planning methods	Number of Mothers (n = 625)	Mean number of live-births per married woman			
		Unadjusted		F-statistics	
		Mean	SE	F-ratio	p-level
Non-users	364 (58.24)	3.04	0.09	94.01	0.00001
Users	261 (41.76)	1.88	0.09		

Figures within parentheses indicate percentages
**Inclusive of modern contraceptives and any other methods*

Age at marriage and independent factors

Table 4.15 shows the summary of the regression analysis on the effects of socio-economic factors on age at marriage. In this model, we have taken into consideration the residence (rural/urban), religion, generation, maternal education, household income and family size as independent factors whereas age at marriage is taken as dependent factors. It is seen from Table 4.15 that age at marriage is dependent on generation, maternal education, household income and family size. It may be noted that the mean age at first child birth (23 years) was taken into consideration while diving the women into generations (Khongsdier and Ghosh, 1994). We have divided the women population aged 15-49 years into three generations, namely, first generation ($\leq$ 46 years), second generation (23-46 years) and third generation ($\geq$ 23 years). The results of regression analysis (Table 4.15) indicate that age at marriage and generation are negatively associated ($B = - 1.86 \pm 0.242$, p

< 0.0001), thereby suggesting that the mean age at marriage increases from the first generation (older women) to the second and third generations (younger women). Also, the mean age at marriage is negatively associated with family size (B = - 1.25±0.384, p < 0.0001), i.e., the higher the mean age at marriage, the lower is the family size.

Table 4.15 further shows that mean age at marriage on maternal education (B = 1.36±0.167, p < 0.001) and household income (B = 0.43±0.221, p < 0.05), suggesting that the mean age at marriage is likely to increase with the increasing level of maternal education and household income. The present analysis failed to get a significant correlation between age at marriage and religion or rural-urban setting. Therefore, it is likely that age at marriage does not depend on rural-urban setting and religion in the present population. However, it is dependent on generation of women, maternal education, household income and family size.

Table 4.15. Regression of age at marriage on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)		t-value	p-level
	B	SE		
Age at marriage				
Residence (Rural/urban)	0.031	0.392	0.079	0.9370
Religion	0.226	0.389	0.580	0.5620
Generation	-1.857	0.384	4.834	0.0000
Maternal education	1.361	0.167	8.136	0.0000
Household income	0.428	0.221	1.937	0.0530
Family size	-1.248	0.242	5.166	0.0000
Constant	24.371	1.181	20.643	0.0000

REPRODUCTIVE WASTAGE AND SOCIOECONOMIC FACTORS

Reproductive wastage (spontaneous abortions and still-births) is considered as an indicator of maternal health in this study by assuming that unhealthy mothers are likely to experience a higher incidence of reproductive wastage. The summary of multiple regressions analysis of reproductive wastage and socio economic factors is given in Table

4.16. It shows that the coefficient of regression (B) is highly significant with respect to generation and maternal education. The prevalence of reproductive wastage is negatively associated with generation (B = - 0.107±0.041, t = -2.65, p < 0.008) and maternal education (B = - 0.042±0.021, t = - 2.02, p < 0.044). However, the present analysis failed to get a significant relationship between reproductive wastage and other factors like residence, household income, religion, age at marriage, family size and ANC visit. Thus, it suggests that generation and maternal education are important factors in regulating the reproductive wastage of the present population.

Table 4.16. Coefficients of the multiple regression of reproductive wastage on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)		t-value	p-level
	B	SE		
Reproductive wastage				
1. Residence (Rural/urban)	-0.051	0.039	-1.303	0.193
2. Religion	0.002	0.039	0.052	0.959
3. Generation	-0.107	0.041	-2.647	0.008
4. Age at marriage	-0.001	0.004	-0.293	0.770
5. Maternal education	-0.042	0.021	-2.020	0.044
6. Paternal education	-0.008	0.024	-0.331	0.740
7. Household income	0.041	0.024	1.728	0.085
8. Family size	-0.042	0.025	-1.653	0.099
9. Ante-natal care	0.000	0.042	-0.012	0.991
Constant	0.536	0.154	3.473	0.001

ANTHROPOMETRIC INDICATORS OF NUTRITIONAL STATUS

Table 4.17 shows the means and standard deviations of anthropometric traits for adult females by age groups and residence. The Table shows that there are no significant differences between age groups with respect to anthropometric variables for both rural and

urban areas. As for rural-urban differences, the mean BMI is significantly higher in urban (22.28±2.59 kg/m^2) than in rural (21.81±2.81 kg/m^2) areas ($t = 2.17$, $p < 0.03$). In other words, urban women are likely to have higher BMI than their counterparts in rural areas.

Table 4.17. Means and standard deviations of anthropometric traits for adult females by age groups and residence.

Anthropometric traits	Age groups in years (yrs)						t-value for the difference between age groups
	15-29 yrs (N for rural = 114 N for urban = 103)		30-49 yrs (N for rural = 198 N for urban = 210)		15-49 yrs (N for rural = 312 N for urban = 313)		
	Mean	SD	Mean	SD	Mean	SD	
Rural							
Weight (kg)	51.82	7.73	50.21	7.34	50.80	7.52	1.80
Height (cm)	152.51	4.78	152.48	4.60	152.49	4.66	0.05
Sitting height (cm)	79.88	2.80	79.59	3.02	79.70	2.94	0.86
Body mass index	22.22	2.65	21.58	2.89	21.81	2.81	1.70
Cormic index	0.53	0.01	0.52	0.01	0.52	0.01	0.001
Urban							
Weight (kg)	50.75	5.88	51.93	6.92	51.54	6.61	1.61
Height (cm)	151.57	4.49	152.27	4.67	152.04	4.62	1.35
Sitting height (cm)	79.12	3.74	79.49	3.82	79.37	3.79	0.82
Body mass index	22.09	2.41	22.38	2.67	22.28	2.59	1.04
Cormic index	0.52	0.02	0.52	0.02	0.52	0.02	0.00
Rural and urban							
Weight (kg)	51.32	6.92	51.09	7.17	51.17	7.08	0.40
Height (cm)	152.06	4.66	152.37	4.63	152.26	4.64	0.79
Sitting height (cm)	79.52	3.29	79.54	3.45	79.53	3.39	0.07
Body mass index	22.16	2.53	21.99	2.80	22.05	2.71	0.80
Cormic index	0.52	0.02	0.52	0.02	0.52	0.02	0.00

The percentage distribution of the subjects according to BMI categories is given in Table 4.18. The individuals with BMIs of ≥18.5, 18.5 to 23.0 and ≤ 23.0 kg/m^2 are considered as having underweight, normal and overweight grades of nutritional status respectively (WHO, 2000). Considering the cut-off point of 18.5 kg/m^2 for screening undernourished individuals or individuals with chronic energy deficiency (Ferro- Luzzi *et*

al., 1992; WHO, 1995), the overall prevalence of under-nutrition is higher in rural (14.74%) than urban (10.54%), although it is not statistically significant ($\chi^2 = 2.13$, $p > 0.05$). Pooling the data for both rural and urban areas, the over prevalence of under-nutrition is 12.64%.

With respect to overweight, it has been suggested recently that the BMI ≥ 23.0 kg/m^2 should be considered the cut- off points for screening overweight in Asian populations (WHO, 2000c). Using the cut-off point of 23.0 kg/m^2 as the cut-off for screening overweight individuals, it is found that about 23.08% of rural mothers and 36.10% of urban mothers are overweight in the present population. It indicates that the prevalence of overweight is higher in urban females than the rural females, and the difference is statistically significant ($\chi^2 = 10.75$, $p > 0.001$). This is according to the theoretical expectation that individuals in urban areas are likely involve in less physical activity, and thereby they are likely to be overweight.

Table 4.18. Percentage distribution of the mothers by BMI categories

Nutritional status based on BMI (kg/m^2)	Rural (n = 312)		Urban (n = 313)		Total (n = 625)	
	Frequency	%	Frequency	%	Frequency	%
≥18.5 (Underweight)*	46	14.74	33	10.54	79	12.64
18.5-23.0 (Normal)	194	62.18	167	53.35	358	57.28
≤ 23.0 (Overweight)**	72	23.08	113	36.10	185	29.60

**χ^2 for rural-urban difference = 2.13, df = 1, p > 0.05*
***χ^2 for rural-urban difference = 10.75, df = 1, p < 0.001*

BIOSOCIAL CORRELATES OF BMI

Table 4.19 shows the correlation of BMI and biosocial variables that are considered in the present study. Of the different variables, only residence (rural-urban setting), cormic index, parental education and household income are significantly correlated with BMI of women. Therefore, we shall consider only these variables for further analysis on the relationship between BMI and biosocial factors in the present study.

Table 4.19. Correlation of BMI and biosocial variables

	Correlation coefficient (r)	p-level
Body mass index (BMI)		
Mother's age	-0.003	P > 0.05
Cormic index	0.128	P < 0.01
Pregnancy status	-0.042	P > 0.05
Number of live-births	-0.054	P > 0.05
Residence (rural/urban)	-0.087	P < 0.05
Religion	-0.032	P > 0.05
Maternal education	0.158	P < 0.001
Paternal education	0.145	P < 0.01
Household income	0.287	P < 0.001
Family size	-0.063	P > 0.05

Cormic index

Table 4.20 shows the means of BMI according to cormic index or relative sitting height index (sitting height/height). The subjects are grouped into two groups: those who have a cormic index of < 0.52 and those who have a cormic index of > 0.52. The subjects are divided according to cormic index categories because it is generally reported that BMI is also influenced by cormic index (Norgan, 1994; Khongsdier, 2002). It is found that the mean BMI is significantly higher in females with higher cormic index when compared with those having lower cormic index, even after controlling for other factors. This is in contrast to the general observation that BMI is lower in those populations with higher cormic index (Norgan, 1994), but it is similar to that observed among the Hmars of Mizoram (Varte, 2006). Nevertheless, the present findings indicate that cormic index also influences BMI of adult females.

Table 4.20. Adjusted and unadjusted body mass index by cormic index level

Cormic index level	Number of mothers	Mean body mass index			
		Unadjusted		Adjusted	
		Mean	SD	Mean*	SD
Lower (≥ 0.52)	363	21.80	2.58	21.84	2.61
Higher (≤0.52)	262	22.39	2.85	22.35	2.62
F-statistics		7.30, $p < 0.007$		5.85, $p < 0.01$*	
**Adjusted for residence, household income, maternal education and paternal education*					

Rural-urban setting

Table 4.21 shows the means of BMI according to residence by urban and rural areas. It is observed that the mean BMI is significantly higher in urban than in rural areas ($F= 4.71$, $p < 0.03$). The rural-urban difference is significant, even after controlling for cormic index ($F= 4.61$, $p < 0.03$). However, the difference between rural and urban women disappeared after adjusting for the household income, maternal education and paternal education ($F= 0.07$, $p > 0.05$). This indicates that the rural-urban difference in BMI is mainly because of the differences in socio-economic factors like education and economic conditions.

Table 4.21. Adjusted and unadjusted body mass index by residence of mothers

Residence	Number of mothers	Mean body mass index			
		Unadjusted		Adjusted	
		Mean	SD	Mean**	SD
Rural	312	21.81	2.81	22.04	2.90
Urban	313	22.28	2.60	22.06	2.90
F-statistics		4.71, $p < 0.03$		4.61, $p < 0.03$* 0.07, $p > 0.05$**	
**Adjusted for cormic index* ****Adjusted for cormic index, household income, maternal education and paternal education*					

Household Income

Table 4.22 shows the means of BMI according to income level of the household. As expected, the mean BMI increases with the increasing income level of the household. Applying ANOVA test, the differences between income groups are highly significant (F =

28.14, $p < 0.0001$). The differences are highly significant even after controlling for cormic index, residence, maternal and paternal education. Thus, it suggests that household income seems to be very important factor in influencing the BMI of Loi women.

Table 4.22. Adjusted and unadjusted body mass index by income level

Income group	Number of mothers	Mean body mass index			
		Unadjusted		Adjusted	
		Mean	SD	Mean*	SD
Low	204	21.12	2.72	21.20	2.93
Middle	195	21.91	2.57	21.92	2.64
High	226	23.00	2.51	22.93	2.87
F-statistics		28.14, $p < 0.0001$		18.61, $p < 0.0001$*	
**Adjusted for cormic index, residence, maternal education and paternal education*					

Maternal education

Table 4.23 shows the means of BMI according educational level of the mothers. It is observed that the mean BMI increases with increasing educational level of the mothers. The ANOVA test indicates that the differences between educational groups are highly significant ($F = 7.80$, $p < 0.001$). However, the differences are highly significant even after controlling for cormic index, residence, household income and paternal education. Thus, it is likely that maternal education plays a significant role in influencing the BMI of women in the present population.

Table 4.23. Adjusted and unadjusted body mass index by educational level of mothers

Educational level	Number of mothers	Mean body mass index of mothers			
		Unadjusted		Adjusted*	
		Mean	SD	Mean*	SD
Illiterate	175	21.60	2.92	21.75	3.14
Primary	154	21.52	2.64	21.66	2.69
Secondary	197	22.64	2.58	22.48	2.86
Higher Secondary	99	22.49	2.37	22.06	2.91
F-statistics		7.80, $p < 0.001$		2.80, $p < 0.04$*	
**Adjusted for cormic index, residence, paternal education and household income*					

Paternal education

Table 4.24 shows the means of BMI according to educational level of the fathers. It is observed that the mean BMI increases with the increasing educational level of the fathers. The ANOVA test indicates that the differences between educational groups are highly significant ($F = 16.92$, $p < 0.001$). Adjusting only for cormic index and residence, the differences between educational groups of fathers are still significant ($F = 5.32$, $p < 0.01$). However, the differences disappeared after controlling for cormic index, residence, household income and maternal education. Thus, it is likely that the differences in BMI of mothers by paternal education are mainly confounded by the variation in household income and maternal education.

Table 4.24. Adjusted and unadjusted body mass index by educational level of fathers

Educational level	Number of mothers	Mean body mass index of mothers			
		Unadjusted		Adjusted	
		Mean	SD	Mean**	SD
Illiterate	63	21.74	3.64	22.35	2.87
Primary	170	21.55	2.67	21.95	2.88
Secondary	237	22.04	2.58	22.07	2.72
Higher Secondary	155	22.73	2.54	22.43	3.06
F-statistics		16.92, $p < 0.001$		5.32, $p < 0.01$* 1.18, $p = 0.319$**	

**Adjusted for cormic index and residence*
***Adjusted for cormic index, residence, maternal education and household income*

BIOSOCIAL CORRELATES OF UNDERWEIGHT AND OVERWEIGHT

Table 4.25 shows the biosocial correlates of underweight and overweight as indicated by BMI. In the present study, we have considered ten biosocial variables that may be associated with both underweight and overweight. It is seen from the Table that underweight is significantly associated with only two variables, namely, pregnancy status and household income. It is negatively associated with household income ($B = -0.828 \pm 0.199$, $p < 0.001$) and positively associated with pregnancy status ($B =$

0.797±0.426, $p < 0.05$). As for overweight, it is likely that cormic index and household income are important factors. It is found that overweight is positively associated with both cormic index (B = 0.466±0.188, $p < 0.01$) and household income (B = 0.791±0.142, $p < 0.0001$). Accordingly, we may conclude that household income is the most important factor for regulating underweight and overweight in women of the present study.

Table 4.25. Coefficients of the logistic regression of underweight and overweight on independent factors

Parameters	Coefficient of regression (b) and its standard error (SE)		Wald test	p-level
	B	SE		
Underweight				
1. Age	-0.025	0.095	0.07	0.789
2. Cormic index	-0.148	0.264	0.31	0.575
3. Pregnancy status	0.797	0.426	3.50	0.052
4. Live-births	0.264	0.246	1.15	0.283
5. Residence (rural/urban)	0.072	0.305	0.06	0.814
6. Religion	-0.010	0.294	0.01	0.974
7. Household income	-0.828	0.199	17.35	0.000
8. Family size	0.018	0.220	0.07	0.935
9. Maternal education	-0.227	0.164	1.92	0.166
10. Paternal education	0.106	0.179	0.35	0.555
Constant	-0.685	0.818	0.70	0.402
Overweight				
1. Age	-0.026	0.072	0.13	0.720
2. Cormic index	0.466	0.188	6.14	0.013
3. Pregnancy status	-0.205	0.388	0.28	0.597
4. Live-births	0.117	0.194	0.37	0.545
5. Residence (rural/urban)	0.325	0.227	2.04	0.153
6. Religion	0.017	0.232	0.01	0.941
7. Household income	0.791	0.142	30.90	0.000
8. Family size	0.062	0.164	0.15	0.703
9. Maternal education	0.094	0.118	0.64	0.422
10. Paternal education	-0.029	0.133	0.05	0.825
Constant	-4.047	0.643	39.56	0.000

HEMOGLOBIN CONTENT AND BIOSOCIAL CORRELATES

Table 4.26 shows the means and standard deviations of hemoglobin level of mothers by age groups for both rural and urban areas. It is seen from the Table that the mean hemoglobin content in the age group 15-29 years is 11.86±1.04 g/dl for rural and 11.70±1.01 g/dl for urban areas. In the age group 30-49 years the mean is 11.79±0.97 g/dl for rural and 11.77±1.06 g/dl for urban areas. There are no significant differences between

age groups and between urban and rural areas. The overall mean hemoglobin level is 11.78±1.02 g/dl.

Table 4.26. Means and standard deviation of hemoglobin content by age and residence

Age groups	Rural			Urban			t-value
	N	Mean	SD	N	Mean	SD	
15-29	96	11.86	1.04	103	11.70	1.01	1.19
30-49	171	11.79	0.97	207	11.77	1.06	0.21
15-49	267	11.81	0.99	310	11.75	1.04	0.71

Overall mean hemoglobin level = 11.78 ± 1.02 g/dl

Table 4.27. Correlation of Hemoglobin content and biosocial variables

	Correlation coefficient (r)	Significant-level
Hemoglobin content		
Mother's age	-0.027	$p > 0.05$
Pregnancy status	0.143	$p < 0.001$
Underweight	-0.100	$p < 0.05$
Overweight	-0.114	$p < 0.001$
ANC visit	-0.064	$p > 0.05$
Residence (rural/urban)	-0.034	$p > 0.05$
Religion	-0.033	$p > 0.05$
Maternal education	0.140	$p < 0.001$
Paternal education	0.115	$p < 0.01$
Household income	0.193	$p < 0.001$
Family size	-0.060	$p > 0.05$

An attempt has also been made to show in Table 4.27 the correlation of hemoglobin level and other biosocial factors. It is seen that hemoglobin level is significantly correlated with pregnancy status (pregnant and non-pregnant), underweight, overweight, maternal education, paternal education and household income. It is found that the hemoglobin content of women in the present study is not significantly correlated with age groups, residence (urban and rural), religion (Hindus and Non-Hindus) and antenatal care

(attendants and non-attendants during the last pregnancy). Therefore, only the effects of the associated factors will be analyzed and presented as follows:

Pregnancy status

Table 4.28 shows the adjusted and unadjusted means of Hb content by pregnancy status of women. It is observed that the mean Hb content is significantly lower among the pregnant (11.27±1.00 g/dl) than among the non-pregnant women (11.82±1.04 g/dl). As theoretically expected, the difference between pregnant and non-pregnant women with respect to Hb content is statistically significant even after adjusting for the nutritional status (BMI categories), household income, maternal education and paternal education. It may be mentioned here that the World Health Organization (WHO, 1968) has recommended the cut–off point of 11.0 g/dl for pregnant and 12.0 g/dl for non-pregnant women to screen anemia in a population

Table 4.28. Adjusted and unadjusted means of Hb content by pregnancy status of women

Pregnancy status	Number of mothers	Mean Hb content			
		Unadjusted		Adjusted*	
		Mean	SD	Mean	SD
Pregnant	43	11.27	1.00	11.27	0.99
Non-pregnant	534	11.82	1.04	11.82	0.99
F-statistics		11.97, $p < 0.001$		11.85, $p < 0.001$*	
**Adjusted for nutritional status (BMI categories), household income, maternal education and paternal education*					

Nutritional status

Table 4.29 shows the adjusted and unadjusted means of Hb content by nutritional status of women. It is observed that the mean Hb content is lower among the underweight women (11.51±1.01 g/dl) as compared with the normal (11.74±0.95 g/dl) and overweight (11.95±1.10 g/dl) women. The ANOVA test also indicates that the differences in Hb content between nutritional groups of women are statistically significant ($F = 5.36$, $p < 0.005$). The differences are still significant even after controlling the effects of parental education ($F = 3.62$, $p < 0.02$). However, the differences disappeared after controlling the effects of pregnancy status, household income, maternal education and paternal education ($F = 1.24$, $p > 0.05$). This indicates that the relationship between Hb content and

nutritional status is mainly compounded by factors like pregnancy and economic status of women in the Loi population.

Table 4.29. Adjusted and unadjusted means of Hb content by nutritional status

Nutritional status	Number of mothers	Mean Hb content			
		Unadjusted		Adjusted	
		Mean	SD	Mean**	SD
Underweight	70	11.51	1.01	11.65	1.01
Overweight	328	11.95	1.10	11.76	1.38
Normal	179	11.74	0.95	11.87	0.74
F-statistics		5.36, $p < 0.005$		3.62, $p < 0.02$* 1.24, $p > 0.05$**	

**Adjusted for maternal education and paternal education*
***Adjusted for pregnancy status, household income, maternal education and paternal education*

Household Income

Table 4.30 shows the adjusted and unadjusted means of Hb content by income level of the women's household. It is observed that the means of Hb content increase with the rise in income level. The ANOVA test also indicates that the differences in Hb content between income groups of women are statistically significant ($F = 11.44$, $p < 0.001$). The differences between income groups of women are statistically significant even after adjusting for the effects of pregnancy status, nutritional status (BMI categories), maternal education and paternal education ($F = 4.90$, $p < 0.008$). Thus, we may conclude that household income or economic condition is a very important factor in influencing the mean Hb content among the Loi women of the present study.

Table 4.30. Adjusted and unadjusted means of Hb content by income level

Income group	Number of mothers	Mean Hb content			
		Unadjusted		Adjusted*	
		Mean	SD	Mean	SD
Low	173	11.50	1.00	11.56	1.07
Middle	184	11.80	0.95	11.81	0.99
High	220	11.98	1.04	11.93	1.08
F-statistics		11.44, $p < 0.001$		4.90, $p < 0.008$*	

**Adjusted for pregnancy status, nutritional status (BMI categories), maternal education and paternal education*

Parental Education

Table 4.31 shows the adjusted and unadjusted means of Hb content by educational level of women. It is observed that both adjusted and unadjusted means of Hb content tends to increase with the rise in educational level of mother, despite discrepancies between secondary and higher secondary levels of education. The ANOVA test also indicates that the differences in Hb content between educational groups of mother are statistically significant ($F = 5.11$, $p < 0.002$). The differences between educational groups of mother are statistically significant even after adjusting for pregnancy status, nutritional status (BMI categories) and household income ($F = 2.70$, $p < 0.05$). However, the effect of maternal education on Hb content disappeared after controlling the effects of pregnancy status, nutritional status (BMI categories), household income and paternal education ($F = 2.43$, $p > 0.05$). Thus, we may conclude that the effect of maternal education on Hb content is also confounded by other factors such as pregnancy status, nutritional status, paternal education and household income.

The unadjusted and adjusted means of Hb content by educational level of the fathers are given in Table 4.32. Although the differences in mean Hb content of mothers according to educational levels of the fathers are statistically significant ($F = 2.75$, $p < 0.04$), such differences disappeared after controlling the effects of maternal education. So, it indicates that maternal education is more important than paternal education in influencing the Hb content of mothers in the present population.

Table 4.31. Adjusted and unadjusted means of Hb content by educational level of mothers

Educational level	Number of mothers	Mean Hb level of mothers			
		Unadjusted		Adjusted**	
		Mean	SD	Mean	SD
Illiterate	151	11.52	0.96	11.57	1.12
Primary	143	11.78	0.94	11.82	1.00
Secondary	188	11.94	1.03	11.90	1.04
Higher Secondary	95	11.87	1.12	11.79	1.08
F-statistics		5.11, $p < 0.002$		2.70, $p < 0.05$* 2.43, $p > 0.05$**	

**Adjusted for pregnancy status, nutritional status (BMI categories) and household income*
***Adjusted for pregnancy status, nutritional status (BMI categories), paternal education and household income*

Table 4.32. Adjusted and unadjusted means of Hb content by educational level of fathers

Educational level	Number of mothers	Mean Hb content of mothers			
		Unadjusted		Adjusted*	
		Mean	SD	Mean	SD
Illiterate	52	11.60	0.99	11.71	1.01
Primary	156	11.63	1.01	11.70	1.01
Secondary	219	11.82	1.00	11.81	0.99
Higher Secondary	150	11.92	1.03	11.83	1.07
F-statistics		2.75, $p < 0.04$		0.52, $p > 0.05$	

**Adjusted for maternal education*

ANEMIA AND BIOSOCIAL CORRELATES

Table 4.33 shows the percentage distribution of mothers by hemoglobin level for both urban and rural areas. Following the cut-off points suggested by the WHO Scientific Working Group (WHO, 1968), the prevalence of anemia among pregnant women is higher in urban (36.84%) than in rural (20.83%) areas, although it is not statistically significant ($\chi^2 = 1.35$, df = 1, $p > 0.05$). In the case of non-pregnant women, the prevalence of anemia is more or less similar between urban women (40.89%) and rural women (40.33%). It is also found that the prevalence of anemia is higher among non-pregnant women (68.45%) than among pregnant women (38.71%), although it is not statistically significant ($\chi^2 = 2.70$, df = 1, $p > 0.05$). Thus, despite the absence of statistical differences, the present findings are inconsistent with the general observation that the prevalence of anemia is higher in rural than in urban areas, or among the pregnant women than among the non-pregnant women. However, the sample size for pregnant women in the present study is very small. Accordingly, the results may not be considered as being representative of the population.

Table 4.34 shows the coefficients of the logistic regression of anemia on independent factors. Of many variables included in the model, only household income is found to be significantly associated with the prevalence of anemia among women of the present population. We shall discuss this result in chapter VI.

Table 4.33. Percentage distribution of the mothers by hemoglobin level

Categories	Rural (N for PW = 24 N for NPW = 243)		Urban (N for PW = 19 N for NPW = 291)	
	Frequency	%	Frequency	%
Pregnant				
> 11.0	5	20.83	7	36.84
11.0-12.0	12	50.00	12	63.16
< 12.0	7	29.17	0	0.00
Non-pregnant				
> 12.0	98	40.33	119	40.89
12.0-13.0	136	55.97	163	56.02
< 13.0	9	3.70	9	3.09

Note: PW – Pregnant women; NPW – Non-pregnant women
χ^2 for rural-urban difference: Pregnant = 1.35, df = 1, $p > 0.05$; Non-pregnant = 0.16, df = 2, $p > 0.05$

Table 4.34. Coefficients of the logistic regression of anemia on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)		Wald test	p-level
	B	SE		
Anemia				
1. Age	0.036	0.199	0.033	0.856
2. Residence (rural/urban)	0.134	0.219	0.374	0.541
3. Religion	0.235	0.218	1.158	0.282
4. Underweight	0.180	0.267	0.453	0.501
5. Pregnancy status	-0.590	0.366	2.597	0.107
6. ANC visit	0.028	0.228	0.015	0.904
7. Family size	-0.043	0.135	0.101	0.751
8. Household income	-0.381	0.129	8.790	0.003
9. Maternal education	-0.108	0.110	0.957	0.328
10. Paternal education	0.044	0.128	0.119	0.730
Constant	-0.135	0.597	0.051	0.821

ANTENATAL CARE CHARACTERISTICS

Table 4.35 shows the characteristics of ante-natal care (ANC) among women (aged >45 years) during pregnancy for both rural and urban areas. It may be mentioned that ANC characteristics reported in this study are based on those received by mothers from both private and government ANC services. It is found that about 85.40% of women in rural areas and 86.81% of them in urban areas are aware of antenatal care services. This indicates that there is not much difference between urban and rural areas with respect to awareness of ANC services (χ^2 = 0.06, df = 1, p > 0.05). However, the proportion of women attending ANC services is higher in urban (81.82%) than in rural (78.83%) areas, despite the absence of statistical difference (χ^2 = 0.77, df = 1, p > 0.05). As for the proportion of those who attended ANC services at least four times, it is found to be significantly lower in rural (32.12%) than in urban (42.18%) areas (χ^2 = 20.78, df = 1, p < 0.05). Table 4.35 further shows the percentage distribution of women according to pregnancy stage at the time of first visit to ANC services. Of those women who attended ANC service, about 78.83% of them in rural areas and 81.82% in urban areas made their first ANC visit during the 1st trimester of pregnancy. Although the rural-urban difference is insignificant (χ^2 =1.69, df = 1, p > 0.05). As regards the nature of ANC services, Table 4.35 shows that about 59.72% of rural women and 72.44% of urban women, who attended ANC during pregnancy, have received iron and folic acid tablets during their visit to private and government ANC centres. This-rural-urban difference is also found to be statistically significant (χ^2 = 7.97, df = 1, p < 0.01). With respect to tetanus and toxoid injections, it is seen from the Table that there are differences between rural and urban areas (χ^2 = 12.99, df = 2, p < 0.001). It is found that the proportion of pregnant women, who received at least 2 doses of tetanus and toxoid injections, is significantly lower in rural (81.48%) than in urban (92.89%) areas (χ^2 = 12.99, df = 1 p < 0.001). Therefore, it indicates that the nature of ANC services is poorer in rural than in urban areas as generally expected. Thus, the present findings suggest that the Loi women are not only aware of ANC services but also participated to a great extent.

Table 4. 35. Characteristics of ante-natal care (ANC) among women (aged > 45 years) during pregnancy**

Characteristics	Rural (n = 274)	Urban (n = 275)	χ^2 - value
	Frequency (%)	Frequency (%)	
Awareness of ANC service			
No	40 (14.60%)	38 (13.82%)	0.06
Yes	234(85.40%)	237 (86.18%)	
Attending ANC			
No	58 (21.17%)	50 (18.18%)	0.77
Yes	216 (78.83%)	225 (81.82%)	
Number of ANC visits			
0	58 (21.16%)	50 (18.18%)	
1	21 (7.66%)	2 (0.72%)	
2	29 (10.58%)	24 (8.72%)	20.78, $p < 0.01$
3	78 (28.47%)	83 (30.18%)	
4	88 (32.12%)	116 (42.18%)	
Stage of pregnancy at 1st ANC visit			
1st Trimester	196 (71.53%)	222 (80.72%)	1.69, $p > 0.05$
2nd Trimester	14 (5.11%)	1 (0.36%)	
3rd Trimester	6 (2.19%)	2 (0.72%)	
Receipt of Iron & Folic Acid Tablet			
No	87 (40.28%)	62 (27.56%)	7.97, $p < 0.00$
Yes	129 (59.72%)	163 (72.44%)	
Doses of Tetanus Toxoid Injections			
0	16 (7.41%)	7 (3.11%)	12.99, $p < 0.00$
1	24 (11.11%)	9 (4.00%)	
≥ 2	176 (81.48%)	209 (92.89%)	

** *Based on the last pregnancy for the non-pregnant women during the survey*

ANC Attendance and Socio-economic Correlates

Table 4.36 shows the summary of the logistic regression of ANC attendance (based on number of women who visited ANC services at least once) during pregnancy on socio-economic factors. We have adopted three models of logistic regression analysis for understanding the effects of socio-economic factors on ANC attendance of women during pregnancy. In the first model, each of the 7 socio-economic variables shown in the Table was treated as independent variables with ANC attendance as dependent variable. It is seen that ANC attendance is significantly associated with maternal age, family size, household income, maternal and paternal education. In model 2, an attempt has been made to include only those variables that are significantly associated with attendance of ANC as covariates in order to understand the relative importance of each independent variable. It is seen that, although family size and household income are negatively associated with ANC attendance, their effects disappeared when they are considered jointly with maternal age, maternal and paternal education. In model 3, we included only mother's age, maternal and paternal education, and all are significantly associated with ANC attendance. Thus, it indicates that maternal age, maternal and paternal educations are important factors in influencing women to attend ANC services.

Table 4.36. Coefficients of the logistic regression of ANC attendance during pregnancy on independent factors (based on the last pregnancy for the non-pregnant women during the survey)

Parameters	Coefficient of regression (B) and its standard error (SE)					
	Model-1		Model-2		Model-3	
	B	SE	B	SE	B	SE
ANC Attendance						
1. Maternal age	-0.579*	0.092	-0.427*	0 .097	-0.449*	0.096
2. Residence (rural/urban)	0.189	0.215	-	-	-	-
3. Religion	-0.154	0.224	-	-	-	-
4. Family size	-0.325*	0.158	-0.274	0.199	-	-
5. Household income	0.390*	0.132	-0.095	0.174	-	-
6. Maternal education	0.865*	0.123	0.443*	0.145	0.453*	0.142
7. Paternal education	0.928*	0.132	0.611*	0.164	0.560*	0.153

*p < 0.05

Model-1 includes ANC attendance and each independent variable

Model-2 includes maternal age, household income, maternal and paternal education as covariates

Model-3 includes only maternal age, maternal and paternal education as covariates

OBSTETRIC MORBIDITY

Table 4.37 shows prevalence of the different types of self-reported obstetric morbidity (morbidity during last pregnancy before the survey) by women (aged > 45years) for both rural and urban areas. It is found that the prevalence rates of different obstetric problems are higher in rural than in urban areas, with the exception of excessive fatigue which is higher in urban than in rural areas. However, the rural-urban differences are not statistically significant except in the case of night-blindness and blurred vision, which is significantly higher in rural (6.69%) than in urban (2.21%) areas (χ^2 = 6.32, df = 1, p > 0.05). The overall prevalence of obstetric morbidity (*morbidity of women who suffered from at least one health problems)* is 60.21% for rural and 57.54% for urban areas.

Table 4. 37. Self-reported obstetric morbidity of women (aged > 45 years)*

Common obstetric problems	Rural (n = 274)		Urban (n = 275)		χ^2 - value
	Number	%	Number	%	
Cold and fever	18	6.69	14	5.09	0.50
Vaginal bleeding	20	7.39	12	4.43	2.00
Urination problems	14	5.10	18	6.54	0.50
Reproductive tract sepsis	3	1.09	1	0.36	1.00
Abdominal and pelvic pain	23	8.44	20	7.32	0.20
Swelling of legs	64	23.47	60	21.98	0.12
Excessive fatigue	98	35.86	102	37.10	0.08
Night-blindness and blurred vision	18	6.69	6	2.21	6.32, p< 0.05
Overall morbidity**	165	60.21	158	57.54	0.15

**Based on the last pregnancy for the non-pregnant women during the survey*
***Based on the number of women who suffered from at least one of the mentioned categories of health problems.*

Obstetric Morbidity and Biosocial Correlates

The Coefficients of the logistic regression of morbidity during pregnancy (obstetric morbidity) on independent factors are given in Table 4.38. It is seen from the Table that the coefficient of regression (B) is independently associated with maternal age, household-

income, ANC visit, maternal and paternal education. Like in the case of ANC characteristics, we included in the model-2 only these variables that significantly associated with obstetric morbidity. It is found that obstetric morbidity is significantly correlated with maternal age (B = 0.190±0.073, $p < 0.005$), household-income (B = -0.321±0.122, $p < 0.05$), paternal education (B = - 0.289±0.131, $p < 0.03$) and ANC visit (B = 1.060±0.257, $p < 0.001$). Thus, it indicates that obstetric morbidity increases with increasing age groups of mothers and decreases with increasing levels of household income and paternal education. However, it is not clear why obstetric morbidity is significantly higher in those women who attended ANC services. However, it is clear that maternal age, household income and paternal education are important factors in influencing obstetric morbidity in the present population. It also indicates that paternal education is more important than maternal education in influencing obstetric morbidity.

Table 4.38. Coefficients of the logistic regression of obstetric morbidity during pregnancy on independent factors (based on the number of women who suffered from any health problems during the last pregnancy)

Parameters	Coefficient of regression (B) and its standard error (SE)			
	Model-1		Model-2	
	B	SE	B	SE
Obstetric Morbidity				
1. Maternal age	0.124*	0.065	0.190*	0.073
2. Nutritional status	-0.012	0.097	-	-
3. Anemia	0.015	0.185	-	-
4. Number of live-births	0.256	0.142	-	-
5. Residence (rural/urban)	-0.144	0.174	-	-
6. Religion	0.094	0.178	-	-
7. Family size	0.212	0.130	-	-
8. Household income	-0.377*	0.107	-0.321**	0.122
9. Maternal education	-0.198*	0.084	-0.052	0.112
10. Paternal education	-0.316*	0.099	-0.289*	0.131
11. ANC visit	0.494*	0.216	1.060*	0.257

*$p < 0.05$
Model-1 includes morbidity and each independent variable
Model-2 includes maternal age, household income, maternal and paternal education as covariates

DELIVERY CHARACTERISTICS AND COMPLICATIONS

Table 4.39 shows the self-reported delivery characteristics and complications of women for both rural and urban areas. The Table shows that home delivery is more common in rural (72.84%) than in urban (45.14%) areas, and hospital or private clinic delivery is higher in urban women (54.86%) than in rural women (27.16%). These rural-urban differences with respect to place of delivery are highly significant ($\chi^2 = 39.51$, df = 1, $p < 0.0001$). The Table further shows the nature of assistance received by women during delivery. In rural areas, women are mostly helped by mid-wives (53.09%) as compared to the assistance that they received from the medical doctors and/or nurses. On the other hand, women in urban areas are generally assisted by medical doctors and/or nurses (71.60%) during delivery. These rural-urban differences are also statistically significant ($\chi^2 = 31.60$, df = 1, $p < 0.0001$). With respect to delivery complications, there are no significant differences between rural and urban areas ($\chi^2 = 1.68$, df =1, $p < 0.05$). Thus, although there are no significant differences between rural and urban areas in respect of delivery complications, the present findings indicate that there are significantly rural-urban differences in respect of place of delivery and types of assistance received by women during delivery.

Table 4. 39. Delivery characteristics and self-reported complications during delivery (for women aged > 45 years)*

Delivery characteristics	Rural (n = 243)		Urban (n = 257)	
	Number	%	Number	%
Place of delivery				
Home	177	72.84	116	45.14
Hospital or private clinic	66	27.16	141	54.86
Assistance during delivery				
Mid-wife	129	53.09	73	28.40
Doctor and/or nurse	114	46.91	184	71.60
Delivery complications				
Caesarean	4	1.65	8	3.11
Forceps	3	1.23	11	4.28
Excessive bleeding	13	5.35	9	3.50
Delayed delivery	7	2.90	7	2.72
Total**	24	9.88	30	11.67

Delivery Complications and Biosocial Correlates

Table 4.40 shows the coefficients of the logistic regression of the overall delivery complication on independent factors. Of many biosocial factors considered in the model 1, only maternal age (B = 0.353±0.117, $p < 0.05$) and ANC attendance (B = - 0.799±0.325, $p < 0.05$) are significantly associated with the overall delivery complication that is based on number of women who experienced at least one or more delivery problems. In model-2, only maternal age and ANC attendance are included as covariates of the overall delivery complication. It is found that the effects of both of these factors are still significant which indicates their important role in influencing delivery complications.

Table 4.40. Coefficients of the logistic regression of delivery complications on Independent factors

Parameters	Model-1		Model-2	
	B	SE	B	SE
Delivery complications				
1. Maternal age	0.353*	0.117	0.296*	0.125
2. Attending ANC	-0.799*	0.325	-0.471*	0.250
3. Nutritional status	0.280	0.157	-	-
4. Anemia	0.180	0.295	-	-
5. Number of live-births	0.138	0.223	-	-
6. Residence (rural/urban)	0.187	0.290	-	-
7. Religion	-0.081	0.294	-	-
8. Family size	-0.082	0.220	-	-
9. Household income	0.134	0.177	-	-
10. Maternal education	0.201	0.141	-	-
11. Paternal education	-0.154	0.158	-	-

*$p < 0.05$
Model-1 includes morbidity and each independent variable
Model-2 includes maternal age and ANC attendance as covariates

MORBIDITY DURING THE LAST ONE MONTH PRIOR TO SURVEY

The frequency and percentage distribution of self- reported health problems of all women for both rural and urban areas during the last one is shown in Table 4.41. The self reported symptoms of morbidity are broadly classified into four groups including menstrual problems (Sadana, 2000). **Cold and respiratory** include those symptoms such as cough, runny nose, fever, breathing problem, chest pain, sore throat, etc. **Intestinal disorders** include diarrhea, dysentery, worms, vomiting, and other self-reported problems of stomach pain. **Menstrual problems** include irregularity in menstruating schedules, body pain during menstrual period, and those self-reported problems relating to menses. Self-reported symptoms of morbidity like headache, diabetes, hypertensions and other than the three categories above were included in the category of **Other health problems**.

Table 4.41 shows that the incidence of different types of morbidity is slightly higher in rural than in urban areas, with the exception of menstrual problem which is higher in urban than in rural areas. The prevalence of overall morbidity (based on the number of women who experienced at least one type of health problem during the last one month before the survey) is higher in rural (34.62%) than in urban (27.80%) areas. However, the rural-urban differences in respect of different types of morbidity are not statistically significant. Pooling the data for both rural and urban areas, the prevalence of overall morbidity is 31.20%.

Table 4. 41. Self-reported health problems of all women during the last one month before the survey

Self-reported health problems	Rural (n = 312)		Urban (n = 313)		χ^2 - value
	Frequency	%	Frequency	%	
Cold and respiratory disorders	52	16.67	40	12.78	1.56
Intestinal disorders	21	6.73	19	6.07	0.10
Menstrual problems	31	9.93	32	10.22	0.13
Others*	21	6.73	16	5.11	0.75
Overall morbidity**	108	34.62	87	27.80	3.39

**Headache, diabetes, hypertension, etc.*
*** Based on the number of women who experienced at least one type of health problem during the last one month prior to survey.*

Morbidity and Biosocial Correlates

Table 4.42 shows the coefficients of the logistic regression of overall morbidity on independent factors. It is found that the nutritional status (B = 0.230±0.096, $p < 0.05$) and anemia (B = 0.465±0.185, $p < 0.05$) are positively associated with morbidity. Further, morbidity is negatively associated with household income (b= -0.566 ±0.108, $p < 0.05$), maternal education (b= - 0.307±0.085, $p < 0.05$) and paternal educations (B = -0.230±0.093, $p < 0.05$). In model-2, we included only these variables that are significantly associated with morbidity in order to understand their relative importance. It is found that the effect of paternal education disappeared after adjusting for nutritional status, anemic status, household income and maternal education. It may be mentioned that if only paternal and maternal levels

Table 4.42. Coefficients of the logistic regression of morbidity during the last one month on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)					
	Model-1		Model-2		Model-3	
	B	SE	B	SE	B	SE
General Morbidity						
1. Maternal age	0.020	0.054	-	-	-	-
2. Pregnancy status	-0.170	0.352	-	-	-	-
3. Nutritional status	0.230*	0.096	0.426*	0.111	0.422*	0.110
4. Anemic status	0. 465*	0.185	0.514*	0.193	0.512*	0.193
5. Number of live-births	0.215	0.126	-	-	-	-
6. Residence (rural/urban)	-0.319	0.173	-	-	-	-
7. Religion	0.096	0.177	-	-	-	-
8. Family size	0.216	0.124	-	-	-	-
9. Household income	-0.566*	0.108	-0.641*	0.134	-0.599*	0.128
10. Maternal education	-0.307*	0.085	-0.247*	0.117	-0.176	0.098
11. Paternal education	-0.230*	0.093	-0.039	0.116	-	-

*$p < 0.05$

Model-1 includes morbidity and each independent variable

Model-2 includes nutritional status, anemic status, household income and maternal education as covariates

Model-3 includes only nutritional status, anemic status, household income and maternal education as covariates

of education are included in the model, it is found that morbidity is negatively associated maternal education (B = - 0.247±0.117, $p < 0.01$) but not with paternal education (B = - 0.039±0.116, $p > 0.05$). In model-3, we included only nutritional status, anemic status, household income and maternal education. It is found that only nutritional status, anemic status and household income are significantly associated with morbidity. Thus, it may be concluded that anemic status, nutritional status and household income are strongly associated with general morbidity in the present population.

FAMILY PLANNING METHODS

Table 4.43 shows the prevalence of the awareness of AIDS and adoption of family planning (FP) methods among women (aged > 45 years) for both rural and urban areas. In the present study,

Table 4.43. Awareness of AIDS and adoption of family planning (FP) methods among women (aged ≯45 years)

Delivery characteristics	Rural (n = 274)		Urban (n = 275)	
	Frequency	%	Frequency	%
Awareness of AIDS				
No	2	0.71	1	0.43
Yes	272	99.30	274	99.46
Awareness of FP methods				
No	15	5.54	6	2.21
Yes	259	94.52	269	97.81
Adoption of FP methods				
No	159	58.02	148	53.81
Yes	115	42.00	127	46.21
Methods used				
Pills	12	4.49	22	8.00
Loop or Copper T	44	16.18	33	12.00
Condom	33	12.04	37	13.54
Others*	26	9.59	35	12.72
Sources of modern FP methods				
Hospitals**	57	55.34	58	55.77
Pharmacy	36	34.95	43	41.34
Market	10	9.71	3	2.88

**include female sterilization, withdrawal and avoidance of sex at certain period*

*** include Primary Health Centres, Private and Government Hospitals*

data on acquired immune deficiency syndrome (AIDS) were not collected. However, data on awareness of the dreadful disease were collected from the women covered under the present study. Table 4.43 shows that the awareness of AIDS is very high in both rural (99.30%) and urban (99.46%) areas. Similarly, awareness of family planning methods is very high in both rural (94.52%) and urban (97.81%) areas, although it is slightly lower in the rural areas. As for adoption of family planning methods, it is found to be higher in urban women (46.21%) than in rural women (42%), in spite of the absence of statistical significance (χ^2 = 0.98, df =1, p > 0.05). The Table further shows the types of contraceptive methods used in both rural and urban areas. It is seen that condoms and loop are the most common methods used in both rural and urban areas. It is further observed that private and Government primary health centers or hospitals are the main sources of contraceptive methods.

Adoption of Family Planning and Socio-economic Factors

The coefficients of the logistic regression of adoption of FP methods on socio economic factors are given in Table 4.44. Of the different factors considered in the present study, adoption of family planning methods is found to be positively associated with maternal age (B = 0.207±0.066, p < 0.05), household income (B = 0.590±0.109, p < 0.05), maternal education (B= 0.639±0.091, p < 0.05) and paternal education (B = 0.413±0.100, p < 0.05). In model-2, we included only these variables that are significantly associated with adoption of family planning methods. It is found that the effects of paternal education disappeared after adjusting for maternal age, maternal education and household income. In model-3, we included only maternal education, household income and maternal age. It is found that adoption of family planning methods is significantly associated with all these three variables. Thus, it may be concluded that maternal age, maternal education and household income are very important factors in influencing the adoption of family planning methods.

Table 4.44. Coefficients of the logistic regression of adoption of family planning methods on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)					
	Model-1		Model-2		Model-3	
	B	SE	B	SE	B	SE
Adoption of FP methods						
1. Age	0.207*	0.066	0.348*	0.076	0.350*	0.076
2. Residence	0.171	0.172	-	-	-	-
3. Religion	-0.121	0.177	-	-	-	-
4. Household income	0.590*	0.109	0.355*	0.125	0.328*	0.120
5. Maternal education	0.636*	0.091	0.722*	0.121	0.675*	0.104
6. Paternal education	0.413*	0.100	-0.105	0.134	-	-

*p < 0.05

Model-1 includes adoption of FP methods (coded 1 for yes and 0 for No) and each independent variable

Model-2 includes age, family size, household income and maternal education as covariates

Model-3 includes age, family size and maternal as covariates

CHAPTER V

CHILDREN'S HEALTH AND NUTRITIONAL STATUS

In the present Chapter, we shall describe our findings on children's health and nutritional status taking into consideration infant and juvenile mortality, anthropometric indicators of nutritional status, immunization coverage and self-reported morbidity. An attempt will be made to correlate these indicators with various biosocial factors to understand the child-health in the Loi population.

INFANT AND JUVENILE MORTALITY

The frequency of infant and juvenile mortality is given in Table 5.1. It is seen that the infant mortality rates (i.e. number of deaths before 1 year of life per 100 live births) of both rural and urban areas are 2.09 and 1.02%, respectively. It shows that the infant mortality rate is higher in rural area than in urban area, although it is not statistically significant ($\chi^2 = 2.93$, df = 1, $p > 0.05$). With respect juvenile mortality, it is found that the prevalence is very low in both rural (0.37%) and urban (0.26%) areas. It shows that both infant and juvenile mortality rates are moderately low in the present population. In this connection, it may be mentioned that there is a possibility that the present study might have under-represented the information on juvenile mortality. It may also be noted here that we have not made any attempt to correlate infant mortality or juvenile mortality with other factors due to limited sample size. As a matter of fact, only 25 cases of infant deaths (1.57%) were reported out of 1597 live-births for both rural and urban areas. This figure is beyond expectation which is fairly low for any Indian population, i.e., 16 per 1000 live-births. There is a possibility that the present study might have under-represented the information on infant and juvenile mortality. We hope that future in-depth studies will throw more light on the patterns of infant and juvenile mortality among the Loi Community.

Table 5.1. Infant and juvenile mortality rates

Parameters	Frequency	
	Rural	Urban
Total number of mother	312	313
Total number of live births	815	782
Number of infant deaths (< 1 year of life)	17	8
Number of juvenile mortality (deaths between 1 and 14 years of life)	3	2
Infant mortality rate (%)	2.09	1.02
Juvenile mortality rate (%)	0.37	0.26

SELF-REPORTED MORBIDITY

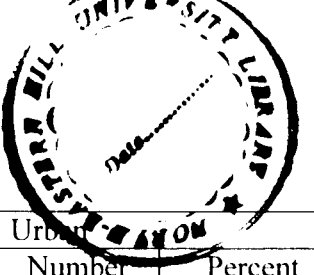
Table 5.2 shows the prevalence of self-reported morbidity for girls and boys in both rural and urban areas. As defined in Chapter III, the term "morbidity" in this study was defined simply in terms of the number of 'days ill' and/or 'days lying in bed' due to any health problems in the last four weeks before the survey.

It can be observed that the rural-urban differences in the prevalence of health problems among girls are not clearly consistent. The prevalence of cold and respiratory disorders is higher in urban girls (5.29%) than in rural girls (3.98%), whereas the prevalence of intestinal disorders is higher in rural girls (5.97%) than in urban girls (4.33%). Nevertheless, the rural-urban difference in the overall prevalence of morbidity is not statistically significant ($\chi^2 = 0.07$, df = 1, $p > 0.05$), although it is slightly higher in rural girls (11.44%) than in urban girls (10.58%).

In the case of boys, the rural-urban differences in the prevalence of health problems among girls are clearly discernible. Table 5.2 shows the prevalence of the three different types of self-reported morbidity is higher in rural than in urban boys. Similarly, the overall prevalence of morbidity is higher in rural boys (13.57%) than in urban boys (7.29%) and the difference is statistically significant ($\chi^2 = 4.10$, df = 1, $p < 0.05$). The estimated odds ratio (OR) at 95% confidence interval (CI) indicates that the rural boys were about 2 times higher in morbidity than their urban counterparts (OR = 2.00, CI = 1.01-3.93, $p < 0.05$).

HILL UNIVERSITY LIBRARY
103833
Date

Table 5.2. Reported morbidity for children aged 3-7 years



Morbidity status	Rural		Urban	
	Number	Percent	Number	Percent
Girls				
Cold and/or respiratory disorders	8	3.98	11	5.29
Intestinal disorders*	12	5.97	9	4.33
Other health problems**	4	1.99	4	1.92
No reported morbidity	178	88.56	186	89.42
Overall prevalence of morbidity***	23	11.44	22	10.58
Number of observation	201	100.00	208	100.00
χ^2 for rural-urban difference = 0.07, df = 1, p > 0.05, OR (95% CI) = 1.09 (0.59-2.03)				
Boys				
Cold and/or respiratory disorders	9	4.52	3	1.56
Intestinal disorders*	11	5.53	5	2.60
Other health problems**	9	4.52	6	3.13
No reported morbidity	172	86.43	178	92.71
Overall prevalence of morbidity***	27	13.57	14	7.29
Number of observation	199	100.00	192	100.00
χ^2 for rural-urban difference = 4.10, df = 1, p < 0.05, OR (95% CI) = 2.00 (1.01-3.93)				

**Intestinal disorders include Diarrhoea, vomiting and/or dysentery*
***Other health problems include fever, measles, scabies, etc.*
****Based on number of the individuals with reported morbidity*

Self-Reported Morbidity and Socioeconomic Factors

We have adopted three models of logistic regression analysis for understanding the effects of biological and socioeconomic factors on morbidity of children. In the first model, each of the 7 biosocial variables shown in the Table 5.3 was treated as independent variable with over self-reported morbidity as dependent variable. It is seen that morbidity is significantly associated with only under-nutrition and household income. In model 2, an attempt has been made to include only under-nutrition and household income as covariates in order to understand the relative importance of these two independent variables. It is found that morbidity is positively associated with under-nutrition (B = 1.578±0.266, p <

0.01) and negatively associated with household income (B = - 0.772±0.188, $p < 0.01$). Thus, we may conclude that under-nutrition and household income are important factors in influencing morbidity patterns among the Loi Children of the present study.

Table 5.3. Coefficients of the logistic regression of morbidity on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)			
	Model-1		Model-2	
	B	SE	B	SE
12. Sex	-0.054	0.229	-	-
13. Under-nutrition**	1.687*	0.263	1.578*	0.266
14. Residence (rural/urban)	-0.368	0.231	-	-
15. Religion	-0.050	0.258	-	-
16. Family size	0.295	0.183	-	-
17. Household income	-0.865*	0.184	-0.772*	0.188
18. Maternal education	-0.103	0.138	-	-
8. Paternal education	-0.198	0.129	-	-

*$p < 0.05$
Model-1 includes morbidity and each independent variable
Model-2 includes under-nutrition and household income and paternal as covariates
** *Under-nutrition refers to either one or all forms of under-nutrition like stunting, wasting and underweight*

NUTRITIONAL STATUS

Under-nutrition and infectious diseases is one of the major health problems in many developing countries (WHO, 1990). It is generally reported that the basic causes of under nutrition and infections in developing countries are poverty, poor hygienic conditions and little access to preventive and health care (Mitra, 1985; WHO, 1990). Hence, assessment of the nutritional status of population has attracted the attention of not only the nutritionists but other biological and social scientists (Osmani, 1992). Nutritional status is defined as a physical expression of the relationship between the nutrient intakes, or bio-availability of nutrients, and the physiological requirements of an individual (Brown, 1984). This physical expression of the relationship between nutrient intakes and

physiological requirements of a person can be measured by a number of methods. Of different methods, anthropometry is one that is generally used for measuring the magnitude of under nutrition at both individual and population levels. Anthropometric measurements and indices like weight, height, weight-for–age, height-for–age, and weight-for-height, body mass index, etc. (WHO, 1963; Jelliffe, 1966; Frisancho, 1990) are used for assessing nutritional status of the children.

In the present study, we have taken three important anthropometric indices, i.e., weight-for-age, height-for-age, and weight-for-height for assessing the nutritional status of the children aged 3-7 years. We have also made an attempt to correlate these indices with certain socioeconomic variables such as household income, family size, place of residence, maternal and paternal education, morbidity status, immunization status, etc. The findings of the study may be presented as follows:

Weight-for-age

Weight-for-age, expressed as a Z-score of the individual weight to the median or 50^{th} percentile of the international population references (i.e., WHO/NCHS growth references) is generally considered as one of the indicators of underweight. Children with weight Z scores of < + 2.0, -2.0 to + 2.0, < -2.0 to -3.0 and < -3.0 are categorized as above normal, normal, moderate underweight and severe underweight, respectively (as described in Chapter III). Table 5.4 shows the distribution of children according to their weight status for both rural and urban areas. In the case of boys, the overall prevalence of underweight (moderate and severe) is higher in rural (26.13%) than in urban (21.88%), although the prevalence of moderate underweight is slightly higher in the later (15.63%) than in the former (13.07%). The odds ratio (OR) for rural-urban difference in the overall prevalence of underweight is found to be 1.26, that is, the risk of being underweight is about 1.26 times higher in rural than in urban boys. However, the chi-square test indicates that the rural-urban differences in the prevalence of underweight is not statistically significant (χ^2 = 0.97, df = 1, $p > 0.05$). A similar case is observed among girls. The prevalence of underweight is higher in rural (28.86%) than in urban (23.56%) areas. The risk of being underweight in rural girls is about 1.31 times as compared to urban girls, despite the absence of statistical difference (χ^2 = 1.49, df = 1, $p > 0.05$). Thus, we may conclude that there are no significant differences between rural and urban children in the prevalence of underweight, although it looks as if it is higher among the rural children. It is also

observed that the overall prevalence of stunting is higher in girls than in boys for both rural and urban areas, despite the absence of statistical difference.

Table 5.4. Nutritional status according to weight-for-age of children aged 3-7 years

Nutritional status	Rural		Urban	
	Number	Percent	Number	Per cent
Boys				
Overweight (< + 2.0 Z-score)	9	4.52	12	6.25
Normal (≤ -2.0 to + 2.0 Z-score)	138	69.35	138	71.88
Moderate underweight (< - 2.0 to -3.0 Z-score)	26	13.07	30	15.63
Severe underweight (< - 3.0 Z-score)	26	13.07	12	6.25
Overall prevalence of underweight	52	26.13	42	21.88
Total number of boys	199	100.00	192	100.00
χ^2 for rural-urban variation* = 0.97, df = 1, p > 0.05, OR (95% CI) = 1.26 (0.79-2.01)				
Girls				
Overweight (< + 2.0 Z-score)	8	3.98	10	4.81
Normal (≤ -2.0 to + 2.0 Z-score)	135	67.16	149	71.63
Moderate underweight (< - 2.0 to -3.0 Z-score)	45	22.39	42	20.19
Severe underweight (< - 3.0 Z-score)	13	6.47	7	3.37
Overall prevalence of underweight	58	28.86	49	23.56
Total number of girls	201	100.00	208	100.00
χ^2 for rural-urban variation* = 1.49, df = 1, p > 0.05 OR (95% CI) = 1.31 (0.85-2.05)				

*Variation in the prevalence of underweight (moderate and severe underweight)

Height-for-age

Table 5.5 shows the nutritional status of children according to height-for-age for both rural and urban areas. Like we did in the case of weight-for-age, the nutritional status of children according to height-for-age is based on the Z-scores of the individual heights relative to the WHO/NCHS population references. Height-for-age is considered as an indicator of stunting or short stature. Table 5.5 shows that the prevalence of moderate and severe stunting is much higher among rural than urban boys. The overall prevalence of stunting is 35.68% in rural and 21.35% in urban boys. The risk of being stunting in rural boys is more than 2 times as compared to urban boys (OR = 2.09, 95% CI: 1.33-3.28, p < 0.001). The chi-square test also indicates that the rural-urban difference is statistically

significant (χ^2 = 10.45, df = 1, p < 0.001). The prevalence of tall stature is also higher in urban (11.46% than in rural (8.54%), although it is not significant.

Among girls, the situation is somewhat different. The prevalence of tall stature is higher in rural (13.93%) than in urban (8.65%), although it is not significant (χ^2 = 2.27, df = 1, p > 0.05). Further, the prevalence of moderate stunting is higher in urban than in rural areas, whereas the prevalence of severe stunting is higher in rural areas. The overall prevalence of stunting is, however, higher in rural (37.81%) than in urban (35.58%) areas, despite the absence of significant difference (χ^2 = 0.22, df = 1, p > 0.05). Thus, we may conclude that there are significant differences between rural and urban boys in respect of stunting, although it is not clearly perceptible in the case of girls. It is also observed that the overall prevalence of stunting is also higher in girls than in boys for both rural and urban areas.

Table 5.5. Nutritional status according to height-for-age of children aged 3-7 years

Nutritional status	Rural		Urban	
	Number	Percent	Number	Per cent
Boys				
Tall stature (> + 2.0 Z-score)	17	8.54	22	11.46
Normal (≤ -2.0 to + 2.0 Z-score)	111	55.78	129	67.19
Moderate stunting (< - 2.0 to -3.0 Z-score)	31	15.58	16	8.33
Severe stunting (< - 3.0 Z-score)	40	20.10	25	13.02
Overall prevalence of stunting	71	35.68	41	21.35
Total number of boys	199	100.00	192	100.00
χ^2 for rural-urban variation* = 10.45, df = 1, p < 0.001, OR (95% CI) = 2.09 (1.33-3.28)				
Girls				
Tall stature (> + 2.0 Z-score)	28	13.93	18	8.65
Normal (≤ -2.0 to + 2.0 Z-score)	97	48.26	116	55.77
Moderate stunting (< - 2.0 to -3.0 Z-score)	20	9.95	29	13.94
Severe stunting (< - 3.0 Z-score)	56	27.86	45	21.63
Overall prevalence of stunting	76	37.81	74	35.58
Total number of girls	201	100.00	208	100.00
χ^2 for rural-urban variation* = 0.22, df = 1, p > 0.05 OR (95% CI) = 1.10 (0.74-1.65)				

*Variation in the overall prevalence of stunting (moderate and severe stunting)

Weight-for-height

Table 5.6 shows the prevalence of wasting as indicated by weight-for-height for both rural and urban areas. It is found that the prevalence of wasting among boys is also higher in rural (6.53%) than in urban (3.13%) areas, although it is not statistically significant (χ^2 = 2.45, df = 1, p > 0.05). The same is true among girls in which the prevalence is higher in rural (7.96%) than in urban (4.33%) areas, despite the absence of statistical difference (χ^2 = 2.35, df = 1, p > 0.05). Table 5.6 further shows that overweight also exists in both boys and girls. The prevalence is higher in urban than in rural areas, although it is not significant.

Table 5.6. Nutritional status according to weight-for-height of children aged 3-7 years

Nutritional status	Rural		Urban	
	Number	Percent	Number	Per cent
Boys				
Overweight (> + 2.0 Z-score)	3	1.51	8	4.17
Normal (≤ -2.0 to + 2.0 Z-score)	183	91.96	178	92.71
Moderate wasting (< - 2.0 to -3.0 Z-score)	13	6.53	6	3.13
Severe wasting (< - 3.0 Z-score)	0	0.00	0	0.00
Overall prevalence of wasting	13	6.53	6	3.13
Total number of boys	199	100.00	192	100.00
χ^2 for rural-urban variation* = 2.45, df = 1, p > 0.05, OR (95% CI) = 2.16 (0.81-5.82)				
Girls				
Overweight (> + 2.0 Z-score)	4	1.99	8	3.85
Normal (≤ -2.0 to + 2.0 Z-score)	181	90.05	191	91.83
Moderate wasting (< - 2.0 to -3.0 Z-score)	12	5.97	9	4.33
Severe wasting (< - 3.0 Z-score)	4	1.99	0	0.00
Overall prevalence of wasting	16	7.96	9	4.33
Total number of girls	201	100.00	208	100.00
χ^2 for rural-urban variation* = 2.35, df = 1, p > 0.05 OR (95% CI) = 1.91 (0.83-4.43)				

*Variation in the prevalence of wasting (moderate and severe wasting)

UNDER-NUTRITION AND BIOSOCIAL FACTORS

In order to understand the effects of biosocial factors on the nutritional status of children in the present population, an attempt has been made to group them into two major groups, namely, normal and undernourished. Undernourished children refer to those children who suffered from at least one of the three nutritional problems, namely, underweight, stunting and wasting as indicated by anthropometric indicators. The overall prevalence of under-nutrition, as defined above, is found to be much higher in girls (44.74%) than in boys (36.32%) and the difference is statistically significant ($\chi^2 = 5.88$, df = 1, $p < 0.01$). It is also found that the prevalence of under-nutrition is higher in rural (44.50%) than in urban (36.75%) and the difference is statistically significant ($\chi^2 = 4.98$, df = 1, $p < 0.02$). It can also be seen from Table 5.7 which indicates the logistic regression of under-nutrition on certain biosocial factors. In model-1, an attempt is made to correlate under-nutrition with each independent factor, and it is found to be significantly associated with sex, morbidity, place of residence, family size, and household income. In model-2, an attempt has been made to include only those variables that are associated significantly with under-nutrition as per model-1. It is found that under-nutrition is positively associated with sex ($B = 0.410 \pm 0.15$, $p < 0.05$) and morbidity ($B = 1.642 \pm 0.27$, $p < 0.05$) and negatively associated with family size ($B = - 0.679 \pm 0.14$, $p < 0.05$) and household income ($B = - 0.416 \pm 0.10$, $p < 0.05$). Therefore, it shows that the effect of place of residence, or rural-urban difference, disappeared after controlling for sex, morbidity, family size and household income. In model-3, an attempt has been made to include only these variables that are significant in model-2 in order to have a better understanding of their relative effects on under-nutrition. It is found that under-nutrition is positively associated with sex ($B = 0.406 \pm 0.15$, $p < 0.05$) and morbidity ($b = 1.649 \pm 0.27$, $p < 0.05$) and negatively associated with family size ($B = - 0.687 \pm 0.14$, $p < 0.05$) and household income ($B = - 0.437 \pm 0.10$, $p < 0.05$). Thus, it may be concluded that under nutrition among the Loi children is highly associated with sex, morbidity status, family size and household income.

Table 5.7. Coefficients of the logistic regression of under-nutrition on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)					
	Model-1		Model-2		Model-3	
	B	SE	B	SE	B	SE
1. Sex	0.351*	0.145	0.410*	0.153	0.406*	0.153
2. Morbidity	1.687*	0.263	1.642*	0.273	1.649*	0.273
3. Residence (rural/urban)	-0.322*	0.144	-0.197	0.155	-	0.151
4. Religion	0.003	0.164	-	-	-	-
5. Family size	-0.369*	0.118	-0.679*	0.138	-0.687*	0.138
6. Household income	-0.348*	0.089	-0.416*	0.103	-0.437*	0.101
7. Maternal education	0.058	0.087	-	-	-	-
8. Paternal education	0.013	0.082	-	-	-	-

*$p < 0.05$

Model-1 includes under-nutrition and each independent variable

Model-2 includes sex, morbidity status, place of residence, family size and household income as covariates

Model-3 includes sex, morbidity status, family size and household income as covariates

IMMUNIZATION COVERAGE

Vaccination of children against six preventable diseases, namely, tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, and measles, has been a very important part of the child health care system in India. The Expanded Programme on Immunization (EPI) was initiated by the Government of India in 1978 with a view to reducing morbidity, mortality, and disabilities from these six diseases by providing free vaccination services to all eligible children. Immunization against poliomyelitis was introduced in 1979–80, and tetanus toxoid for school children was added in 1980–81. Immunization against tuberculosis (BCG) was brought under the EPI in 1981–82. The latest addition to the Programme was vaccination against measles in 1985–86 (Ministry of Health and Family Welfare, 1991).

In the present study, Table 5.8 shows the percentage distribution of children (aged 3-7 years) who are reported to receive vaccinations against tuberculosis (BCG), poliomyelitis, measles and diphtheria. The Table shows that the proportion of girls who received vaccinations are higher in rural and than in urban areas, except for polio. The overall immunization rate (i.e., the number of children who received at least two vaccinations) is also higher in rural (60.20%) than in urban (57.21%), although it is not statistically significant ($\chi^2 = 0.38$, df = 1, $p > 0.05$). On the other hand, the immunization rate in boys is higher in urban (69.27%) than in rural (65.83%) areas. But the differences

are not statistically significant ($\chi^2 = 0.53$, df = 1, $p > 0.05$). Thus, these findings indicate that the rural-urban differences are inconsistent not statistically significant.

As for sex differences, it is found that the immunization rate is higher in boys than in girls for both rural (girls = 60.20%, boys = 65.83%) and urban (girls = 57.21%, boys = 69.27%) areas. The differences are found to be statistically significant in urban areas ($\chi^2 = 6.23$, df = 1, $p < 0.01$), but insignificant in rural areas ($\chi^2 = 1.36$, df = 1, $p > 0.05$). These findings indicate to certain the existence of gender bias with respect to immunization coverage, i.e. it is higher in boys than in girls especially in urban areas. However, we shall have a better understanding of this issue when other covariates are included in the analysis by using logistic regression models in the next paragraph.

Table 5.8. Reported vaccinations for children aged 3-7 years

Vaccinations	Rural		Urban	
	Number	Percent	Number	Per cent
Girls				
BCG	121	60.20	116	55.77
Polio	121	60.20	141	67.79
Measles	120	59.70	113	54.33
Diphtheria	118	58.71	110	52.88
Without any vaccination	80	39.80	67	32.21
Overall immunization rate*	121	60.20	119	57.21
Total number of children	201	100.00	208	100.00
*χ^2 for rural-urban difference = 0.38, df = 1, $p > 0.05$, OR (95% CI) = 1.13 (0.76-1.68)				
Boys				
BCG	131	65.83	131	68.23
Polio	131	65.83	157	81.77
Measles	127	63.82	133	69.27
Diphtheria	122	61.31	128	66.67
Without any vaccination	68	34.17	35	18.23
Overall immunization rate*	131	65.83	133	69.27
Total number of children	199	100.00	192	100.00
*χ^2 for rural-urban difference = 0.53, df = 1, $p > 0.05$ OR (95% CI) = 0.86 (0.56-1.31)				

*Based on number of children who received at least two vaccinations.

Biosocial correlates of Immunization Coverage

Table 5.9 indicates the logistic regression of immunization coverage (i.e., the number of children who received at least two vaccinations) on certain biosocial factors. In model-1, an attempt is made to correlate immunization with each independent factor, and it is found to be significantly associated with sex, morbidity, family size, and household income, parental and maternal education. In model-2, an attempt has been made to include only these variables that are associated significantly with immunization as per model-1. It is found that immunization is negatively associated with morbidity status (B = - 1.212± 0.27, $p < 0.05$) and family size (B = - 0.830±0.15, $p < 0.05$) and positively associated with maternal education (B = 0.472±0.11, $p < 0.05$) and paternal education (B = 0.494± 0.11, $p < 0.05$). Therefore, it shows that the effect of sex and household income disappeared after controlling for morbidity, family size, maternal and paternal education. In model-3, an attempt has been made to include only these variables that are significant in model-2 in order to have a better understanding of their relative effects on immunization coverage. It is found that immunization is negatively associated with morbidity status (B = - 1.265±0.261, $p < 0.05$) and family size (B = - 0. 909±0.139, $p < 0.05$) and positively associated with maternal education (B = 0. 487±0.109, $p < 0.05$) and paternal education (B = 0.553±0.103, $p < 0.05$). Thus, it may be concluded that immunization coverage among the Loi children is highly associated with morbidity status, family size maternal and paternal education

Table 5.9. Coefficients of the logistic regression of immunization on independent factors

Parameters	Coefficient of regression (B) and its standard error (SE)					
	Model-1		Model-2		Model-3	
	B	SE	B	SE	B	SE
1. Sex	-0.381*	0.147	-0.241	0.165	-	-
2. Morbidity	-1.248*	0.238	-1.212*	0.265	-1.265*	0.261
3. Residence (rural/urban)	0.002	0.146	-	-	-	-
4. Religion	0.067	0.167	-	-	-	-
5. Family size	-0.929*	0.129	-0.830*	0.147	-0.909*	0.139
6. Household income	0.666*	0.097	0.175	0.115	-	-
7. Maternal education	0.686*	0.096	0.472*	0.110	0.487*	0.109
8. Paternal education	0.725*	0.091	0.494*	0.108	0.553*	0.103

*p < 0.05

Model-1 includes immunization and each independent variable

Model-2 includes sex, morbidity status, family size, household income, maternal and and paternal education as covariates

Model-3 includes morbidity status, family size, maternal and paternal education as covariates

CHAPTER VI
DISCUSSION

In the present Chapter, we shall briefly discuss our findings in the context of other findings on other populations especially in Northeast India. We shall also look into the implications of the present findings.

In the last two Chapters, an attempt has been made to present our findings on different selected indicators of maternal and child health. Indicators are "markers of health status, service provision or resource availability, designed to enable the monitoring of service performance or programme goals. Monitoring is a process of comparison, across populations or geographical areas, to highlight differentials or to detect changes over time (to measure progress) between reality and goals. Goals or objectives are an essential component in quantifying the aims of health-related policies, programmes and services. At the national and international levels, an indicator must be able to "measure progress" towards agreed goals" (WHO, 2006). In this study, our design is to compare the selected indicators between rural and urban areas in order to understand the progress or improvement of maternal and child health among the Lois of Manipur and to highlight the factors that may influence the overall reproductive and child health, or responsible for the rural-urban differentials in reproductive and child health.

In Chapter IV, we have presented our findings on selected indicators of maternal health or reproductive health, which include demographic variables (such as sex ratio, marital status, age at marriage, age at first child birth, fertility, and reproductive wastage), nutritional anthropometry, anemia, antenatal care, delivery characteristics, adoption of family planning methods and self-reported morbidity. We shall discuss our findings on these indicators of reproductive health under the following sections:

DEMOGRAPHIC INDICATORS

In the present study, we have observed that the Loi population is *progressive* in both rural and urban areas, that is, more than 40% of the total population belonged to the age group 0-14 years (Khongsdier, 2005c). This also indicates that fertility is moderately high during

the last 15 years, despite its decline in recent years. The overall sex ratio does not deviate significantly from the ideal sex ratio of 1:1 in both rural and urban areas. The same is true in the reproductive age group, i.e., 15-49 years. This indicates that there is not much sex difference in mortality during reproductive age for both rural and urban populations. However, the sex ratio in the age group 50 years and above indicates that longevity in rural areas is much shorter in males than in females, despite the absence of statistical difference. On the other hand, the longevity in urban areas is slightly longer in males than in females. With respect to marital status, there is not much difference between rural and urban areas in the proportion of females who are married at the age of 24 years and below. However, the mean age at marriage is significantly higher in the urban women (21.87± 0.27 years) than in the rural women (20.95±0.23 years). The same is true with respect to the mean age at first child birth. It is found that the mean age at marriage among the Loi women is higher than those reported for many populations of Assam (Sengupta and Gogoi, 1995; Gogoi, 2001) and Meghalaya (Khongsdier *et al.*, 2001; Khongsdier, 2005c).

Therefore, the present study suggests that there are no significant differences between rural and urban areas or between the sexes in respect of age and marital structures of the Loi population, although longevity in rural areas seems to be much lower in females in the age group 50 years and above. However, the mean ages at marriage and first child first are significantly higher in the urban women than in the rural women. This may be due to many factors especially schooling and awareness of family planning which are supposed to be higher in urban than in rural areas. We shall look into these aspects when we discuss the socio-economic characteristics taken under the present study.

Fertility Differentials

In the present study, we have taken two measures of fertility, namely, the mean number of live-births per married woman aged 45-49 years, and the total fertility rate (TFR) which is the summation of the age-specific fertility rate (ASMFR). The ASMFR was calculated by dividing the number of live births in a given age group during the five-year period preceding the survey by the number of ever-married women in that age group for the same period. It reaches its peak when the mothers are aged 25-29 years. It is found that the mean numbers of live-births to mothers of all ages is 2.56 ± 0.06. It is more or less similar for both rural mothers (2.61 ± 0.09) and urban mothers (2.50 ± 0.85). The same is true with respect to TMFR which is 3.98 for rural and 3.87 for urban areas. Pooling together for

both rural and urban areas, the TMFR is 3.91. This TMFR among the Loi mothers is higher than that reported for the whole state of Manipur (IIPS, 2000), but lower than the Lotha (7.15) of Nagaland (Benrithung *et al.*, 2005), Hmars (6.10) of Mizoram (Varte, 2006), Semsa (6.03) of Assam (Limbu and Khongsdier, 2000) and War Khasi of Meghalaya (Khongsdier, 2005c). The mean number of live-births to mothers of all ages is also lower than those reported for the Meitei (4.01), Kabui (4.35) and Pangal Muslims (4.12) of Manipur (Singh, 2006), Mukhloms (5.20) of Arunachal Pradesh (Sarkar, 2001), Khasis (5.18) of Shillong (Mukherjee, 2002) and War Khasis (Khongsdier, 2005c).

On the basis of the present findings, we may suggest that fertility rate in the Loi population is approaching to replacement level of 2, a condition that can be observed only in few Indian populations like in Kerala. It is much lower than those reported for many populations in Northeast India (Khongsdier, 2005c). The question that arises to us is that how fertility rate is lower among the Loi population? Or what are the important factors responsible for the decline in fertility among the Lois? To answer this question, we have made an attempt to examine in Chapter IV whether certain selected factors have influenced fertility among fertility among the Lois. Among many factors, it is found that age at marriage, maternal and paternal education, family planning methods and household income are very important factors affecting fertility among the Lois of the present study.

Age at marriage as theoretically expected is an important intermediate variable that influences fertility in human populations where practice of modern contraceptives is absent. In the present study, it is observed that the number of live-births reduced significantly with increasing age at marriage. The effect of age at marriage on fertility can also be observed in relation to the correlation between maternal education and fertility in the present study. It is found that maternal education also significantly influences fertility among the Loi mothers, but when age at marriage is included in the second model of regression analysis, the differences in live-births between educational groups of mother disappeared. This indicates that the effect of maternal education on live-births is strongly compounded by maternal age at marriage. Using regression analysis to make out the factors affecting age at marriage, we find that ~~that~~ maternal education and household income are significantly responsible for increasing age at marriage, thereby reducing fertility rate as observed in other studies (Das and Dey, 1998; Caldwell *et al.*, 1999). An attempt has also been made to find out the relative importance of maternal and paternal

education by using ANCOVA analysis. It is found that that maternal education is more important than paternal education in influencing the fertility rate in the Loi population.

In addition to age at marriage and maternal education, the important factor affecting fertility rate among the Loi women is the economic condition as measured by household income. The effect of household income on live-births is significant even after adjusting for other factors. The significant effect of the household income on fertility rate in this population is likely to be related to the contention that people belonging to the higher economic groups are more conscious of the socio-economic welfare of their children. It is likely that they have higher aspiration for better education and higher economic status, thereby reducing the birth rate in order to provide their children with such facilities (Mukherjee, 2002; Varte, 2006).

Reproductive wastage

In the present study, reproductive wastage (abortions and still-births) is considered as an indicator of maternal health by assuming that unhealthy mothers experience a higher incidence of reproductive wastage. The prevalence of reproductive wastage (i.e., abortions and still births) is 6.32% and 4.88% in rural and urban areas respectively. Although it is higher in rural areas, the difference is not statistically significant. Pooling the data together for rural and urban areas, the overall prevalence of reproductive wastage among the Lois is 5.62%. This rate of reproductive wastage among the Loi women is similar to that reported for the Nepalese (5.92%) of Manipur (Singh, 2006) and Semsa (5.90%) of Assam (Limbu and Khongsdier, 2000) but lower that that reported for the Meitei (7.85%) of Manipur (Singh, 2006) and Munda (8.83%) of Assam (Gogoi, 2002), Pnar (6.18%) of Jatinga (Khongsdier *et al.*, 2001), Khasi (8.16%) of Meghalaya (Mukherjee, 2002) and higher than Hmars (4.11%) of Mizoram (Varte, 2006). The prevalence of reproductive wastage is associated with generation of mothers and education when other factors like residence, religion, household income, age at marriage, family size and ANC visit are also included in the regression model. In other words, older women are likely to have higher prevalence of reproductive wastage than younger women. It is also found that mothers without education or with lower educational levels are likely to have higher prevalence of reproductive wastage in the present population.

Key Points

1. The Loi population seems to be progressive, although there is evidence of recent decline in fertility rate.
2. The overall sex ratio does not deviate significantly from the ideal sex ratio of 1:1 in both rural and urban areas.
3. The longevity in rural areas seems to be much lower in males in the age group 50 years and above.
4. There are significant differences between rural and urban areas in respect of demographic variables. However, the mean age at marriage is significantly higher in the urban women than in the rural women, and it is higher than many populations in Northeast India.
5. The fertility rate is lower than those reported for many populations in Northeast India, and there is no significant difference between rural and urban areas.
6. Of many factors, it is found that age at marriage, maternal education, family planning methods and household income are very important factors affecting fertility in the present population. Maternal education is more important than paternal education in influencing the fertility rate.
7. About 41.76% of mothers have adopted family planning methods.
8. Maternal education and household income are significantly responsible for increasing age at marriage.
9. Reproductive wastage is moderate as compared to other populations in Northeast India. Maternal age and education are the important factors influencing reproductive wastage.

ANTHROPOMETRIC INDICATORS OF NUTRITIONAL STATUS

In the present study, the nutritional status was assessed using body mass index (BMI), which is derived from anthropometric measurements of body weight and height, as internationally recommended (WHO Working Group, 1986; WHO, 1995). It is found that the mean BMI is significantly higher in urban (22.28±2.59 kg/m^2) than in rural (21.81±2.81 kg/m^2) areas ($t = 2.17$, $p < 0.03$). Considering the cut-off point of 18.5 kg/m^2 for screening undernourished individuals (Ferro- Luzzi *et al.*, 1992; WHO, 1995), the overall prevalence of underweight is higher in rural (14.74%) than urban (10.54%),

although it is not statistically significant. The over prevalence of underweight is 12.64%, which is lower than those reported for several populations of Northeast India, such as Caste groups like Brahmins, Kalitas, Jogis, Kaibartas and Hinduised groups like Ahoms, Kochs and Rajbhanjis (Khongsdier, 2001). They are also lower than the tribal groups like Lalungs, Miris (Khongsdier, 2001), War Khasis (Khongsdier, 2002) and Hmars of Mizoram (Varte, 2006). Thus, it may be concluded that the nutritional status in the present populations is better than many populations in Northeast India. Using the cut-off point of 23.0 kg/m^2 as the cut-off for screening overweight individuals, it is also found that the prevalence of overweight is significantly lower in rural mothers (23.08%) than in urban mothers (36.10%). This indicates that overweight is an emerging nutritional problem in the Loi population. In other words, over-nutrition among the Loi community is likely to be a major nutritional problem especially in the next decade or so.

It may be noted that over-nutrition is also emerging with the improvement in socio-economic condition and increasing urbanization in many developing countries. Consequently, the double burden of under- and over-nutrition exerts considerable impact on the economy and health system in many developing countries (Popkin, 1998, 2002). In general, many countries in Asia are in this situation due to "changing dietary pattern towards energy-dense and high fat diets, together with a more sedentary lifestyle arising from increasing urbanization" (Florentino, 2002). The increasing urbanization, changes in standards of living, dietary patterns, occupational-work patterns are risks of the epidemic of obesity and associated morbidity and mortality.

A review of studies India has also revealed the increasing risk of overweight and obesity, especially in urban areas (Shetty, 2002). Visweswara Rao *et al.* (1995) reported that the prevalence of overweight among adults in urban colonies of Hyderabad was 21.8% in males and 27.4% in females, while the prevalence of obesity was 2.1% and 8.9%, respectively. It was also observed that the prevalence of overweight and obesity was higher in the higher income groups for both males and females. A study conducted in urban Delhi by the Nutrition Foundation of India also revealed that the prevalence of overweight (defined as $\geq$ 25 of BMI) among the "middle class" increased from low- to high-income groups, showing that about 32.2% of males and 50.0% of females in the high-income group suffered from overweight (Gopalan, 1998). Both of these studies indicated that the prevalence of overweight and obesity was higher in females than in

males. The higher prevalence of overweight in urban areas of the present population seems to have supported the above contention, if preventive measures of the spread of obesity are not taken.

Thus the spread of overweight and obesity needs to be monitored and prevented, but it should not be done at the expense of the efforts to alleviate under-nutrition. Most nutrition programmes in developing countries pay more attention to alleviating under-nutrition, especially in providing food complements, without much attention to monitor and prevent the epidemic of overweight and obesity that may create more harm in the future generations (Uauy and Kain, 2002).

Another point of significance with respect to the findings of the present study is the relationship between BMI and socio-economic conditions in addition to cormic index. It is observed that mean BMI is positively associated with household income and maternal education. On the other hand, the prevalence of underweight is associated negatively with income and positively with pregnancy status, whereas the prevalence of overweight is associated positively with cormic index and household income. From the socio-economic point of view, the present findings seem to support the suggestion that BMI can be considered as an indicator of standards of living in developing countries (Nube, 1998; Khongsdier, 2002). It is also observed that the rural-urban difference in BMI is mainly because of the differences in socio-economic factors like education and economic conditions. In addition, individuals in urban areas are likely to involve in less physical activity, and thereby they are likely to be overweight. However, BMI is also correlated with biological factors such as cormic index and pregnancy status in the present population.

Key Points

1. It is found that the mean BMI is significantly higher in urban than in rural areas.
2. The prevalence of overweight is higher in urban than in rural areas. The overall prevalence of under-nutrition is lower than those reported for several populations in Northeast India.
3. Overweight among the Loi community, especially in urban areas is likely to be a major nutritional problem especially in the next decade or so, if preventive measures of the spread of obesity are not taken.

4. Considering its relationship with household income and maternal education, BMI is likely to be a good indicator of standard of livings among the Lois.

HEMOGLOBIN LEVEL AND ANEMIC STATUS

In the present study, we have considered the overall hemoglobin (Hb) level and prevalence of anemia as indicators of nutritional and health status of mothers in the present study. It is found that there are no significant differences between age groups and between urban and rural areas with respect to hemoglobin level. The overall mean hemoglobin level is 11.78±1.02 g/dl. This means hemoglobin level among the Loi mothers is lower than Kaibartas (11.97g/dl) of Assam (Khongsdier, 2002) and Hmars (12.27g/dl) of Mizoram (Varte, 2006).

Of many biosocial factors, hemoglobin level is significantly correlated with pregnancy status (pregnant and non-pregnant), underweight, overweight, maternal education and household income. It is observed that the mean Hb content is significantly lower among the pregnant (11.27±1.01 g/dl) than among the non-pregnant women (11.84±1.04 g/dl), even after adjusting for biosocial factors. Therefore, the present findings confirm the recommendation by the World Health Organization (WHO, 1968) that the cut-off point of 11.0 g/dl for pregnant and 12.0 g/dl non-pregnant women be used for screening anemia in a population.

With respect to the effects of nutritional status, it is observed that the mean Hb content is significantly lower among the underweight women (11.51±1.01 g/dl) as compared to the normal (11.74±0.95 g/dl) and overweight (11.95±1.10 g/dl) women. However, the differences disappeared after controlling the effects of pregnancy status, household income, maternal education and paternal education. This indicates that the relationship between Hb content and nutritional status is mainly compounded by factors like pregnancy and economic status of women in the Loi population.

As for the effects of socio-economic factors, it is observed that household income and maternal education are the major factors affecting the mean hemoglobin level in the present population. However, the differences in mean Hb content of mothers according to educational levels of the fathers disappeared after controlling the effects of maternal education. So it indicates that maternal education is more important than paternal education in influencing the Hb content of mothers in the present population.

As for anemia, it is found to be higher among non-pregnant women (68.45%) than among pregnant women (38.71%), although it is not statistically significant ($\chi^2 = 2.70$, df = 1, $p > 0.05$). The rural-urban differences are not significant, although the prevalence of anemia among pregnant women is higher in rural (36.84%) than in rural (20.83%) areas. The present findings are inconsistent with the general observation that the prevalence of anemia is higher in rural than in urban areas, or among the pregnant women than among the non-pregnant women (Thangaleela and Vijayalaxmi, 1994; Rush, 2000; Bulliya, 2004). It may, however, be noted that the sample size for pregnant women in the present study is very small. Accordingly, the results may not be considered as being representative of the population. Nevertheless, the prevalence of anemia among non-pregnant women is found to be higher than that reported for the whole state of Manipur (28.9%) as well as for many other states in Northeast India (IIPS, 2000). It is also higher than that reported for the War Khasi (Khongsdier, 1997), Kaibartas of Assam (Khongsdier, 2002) and Oriya (63%) of Orissa (Bulliya, 2004). In short, the prevalence of anemia among the non-pregnant women of the present study is very high as compared to other populations. The present findings indicate that poor economic status is the main factor that is significantly associated with the prevalence of anemia among women of the present population.

Key Points

1. There are no significant differences between age groups and between urban and rural areas with respect to hemoglobin level and prevalence of anemia. The overall mean hemoglobin level is is lower than some populations in Northeast India.
2. Hb content is significantly lower among the pregnant than among the non-pregnant women.
3. Of many biosocial factors, hemoglobin level is significantly correlated with pregnancy status, underweight, overweight, maternal education and household income.
4. Maternal education is more important than paternal education in influencing the Hb content of mothers.
5. The prevalence of anemia among the non-pregnant women is fairly high as compared to other populations.
6. Poor economic status is the main factor that is significantly associated with the prevalence of anemia among the Loi women.

ANTENATAL CARE CHARACTERISTICS

ANC characteristics in this study are based on those received by women from both private and government ANC services. It is found that that there is no significant difference between urban (86.81%) and rural (85.40%) areas with respect to awareness and of ANC services although the proportion of women attending ANC services is higher in urban (81.82%) than in rural (78.83%) areas. As for the proportion of those who attended ANC services at least four times, it is significantly lower in rural (32.12%) than in urban (42.18%) areas. The proportion of those women who made their first ANC visit during the 1st trimester of pregnancy is significantly higher in urban areas (80.72%) than in rural areas (71.53%). Further, the present study indicates that the nature of ANC services, based on receipt of iron/folic acid tablets and doses of tetanus and toxoid injections, is poorer in rural than in urban areas. In short, the present findings suggest that the Loi women are not only aware of ANC services but also participated to a great extent. However, the nature and frequency of ANC visits and services seems to be poorer in rural than in urban areas as generally expected.

In the present study, an attempt has also been made to understand the effects of socio-economic factors on ANC visits during pregnancy by using logistic regression analysis. Of many covariates, it is found that mother's age, maternal and paternal education are important factors in influencing women to attend ANC services.

Key Points

1. The present findings suggest that the Loi women are not only aware of ANC services but also participated to a great extent.
2. There is no significant difference between urban and rural areas with respect to awareness and visit of ANC services. However, the nature and frequency of ANC visits and services seems to be poorer in rural than in urban areas as generally expected.
3. ANC visits during pregnancy are found to be associated with mother's age, maternal and paternal education.

OBSTETRIC MORBIDITY

In the present study, an attempt has also been made to show the prevalence of the different types of self-reported obstetric morbidity (morbidity during last pregnancy before the

survey) by women (aged < 45years) for both rural and urban areas. It is found that the prevalence rates of different obstetric problems are higher in rural than in urban areas, with the exception of excessive fatigue which is higher in urban than in rural areas. However, the rural-urban differences are not statistically significant except in the case of night-blindness and blurred vision, which is significantly higher in rural (6.69%) than in urban (2.21%) areas. The overall prevalence of obstetric morbidity is slightly higher in rural (60.21%) than in urban (57.54%) areas, despite the absence of statistical difference.

With respect to the effects of biosocial factors, it is found that obstetric morbidity is independently associated with maternal age, household-income, ANC visits, maternal and paternal education. When only these variables are included in the logistic regression model, obstetric morbidity is positively associated with maternal age and ANC visits, but negatively correlated with household-income and paternal education. It is not clear why obstetric morbidity increases in those women who attended ANC care services. It is also found that paternal education is more important than maternal education in influencing obstetric morbidity. It may be noted that earlier studies have also questioned the relative contribution of ANC attendance to maternal health and morbidity (McDonagh, 1996). It is also reported that women, who attended ANC services, have higher rate of obstetric morbidity due to the fact that such women are more aware of their health problems in consultation with professional doctors and nurses. In other words, women without attending ANC services are likely to underrate their health problems. Accordingly, the present findings are consistent with the observation in the Lao people's democratic republic where most women were not aware of the danger signs and symptoms that call for immediate referral (WHO, 2000). The present findings also corroborate with other studies conducted in other parts of India (Bhatia and Cleland 1995; Chandhiok *et al.*, 2006).

Key Points

1. The overall prevalence of obstetric morbidity is higher in rural (60.21%) than in urban (57.54%) areas, despite the absence of statistical difference. However, the prevalence of night-blindness and blurred vision is significantly higher in rural (6.69%) than in urban (2.21%) areas.
2. Of many factors considered, obstetric morbidity is significantly associated only with household-income.

3. Paternal education is more important than maternal education in influencing obstetric morbidity.
4. Women without attending ANC services are likely to underrate their health problems.

DELIVERY CHARACTERISTICS AND COMPLICATIONS

In the present study, we have considered the place of delivery, types of assistance during delivery and self-reported delivery complications under the category of delivery characteristics and complications. The findings indicate that there are significantly rural-urban differences in respect of place of delivery and types of assistance received by women during delivery. It is found that home delivery is significantly higher in rural (72.84%) than in urban areas (45.14%) and hospital or private clinic delivery is significantly higher in urban women (54.84%) than in rural women (27.16%). In rural areas, women are mostly helped by mid-wives (53.09%) as compared to the assistance that they received from the medical doctors and/or nurses. On the other hand, women in urban areas are generally assisted by medical doctors and/or nurses (71.60%) during delivery. With respect to delivery complications, there are no significant differences between rural and urban areas. The overall prevalence of delivery complications is 9.88% and 11.67% in rural and urban areas, respectively.

Of many biosocial factors, delivery complications seem to be positively correlated with maternal age and negatively correlated with ANC visit. Although the relationship between ANC visit and maternal obstetric morbidity, the present study indicates that ANC services are very crucial for safe delivery of the mothers. Thus, the present findings confirm the earlier studies on other populations that there is a significant relationship between ANC visits and obstetric history (Poovan *et al.*, 1990; Thonneau *et al.*, 1992; Bloom *et al.*, 1999).

Key Points

1. There are significantly rural-urban differences in respect of place of delivery and types of assistance received by women during delivery, despite the absence of statistical difference in respect of overall delivery complications.
2. Home delivery is significantly higher in rural than in urban areas.

3. The present study indicates that ANC services are very crucial for safe delivery of the mothers.
4. Maternal age and ANC visit are the major factors influencing delivery complications in the present population.

SELF-REPORTED MORBIDITY

Data on morbidity were based on "self-reported illness experience" of a subject as generally adopted in surveys, which did not involve a clinician (Strickland and Ulijaszek, 1993; Garcia and Kennedy, 1994; Strickland and Tuffrey, 1997). It is found that the rural-urban differences in respect of different types of morbidity are not statistically significant. The prevalence of overall morbidity (based on the number of women who experienced at least one type of health problem during the last one month before the survey) is higher in rural (34.62%) than in urban (27.80%) areas, despite the absence of statistical difference. Pooling the data for both rural and urban areas, the prevalence of overall morbidity is 31.20%. It is found that anemic status, nutritional status and household income are strongly associated with general morbidity in the present population.

Key Points

1. There are no significant differences between rural and urban areas in the prevalence of different types of self-reported morbidity, although it seems to be higher in rural areas.
2. Anemia, nutritional status and household income are strongly associated with general morbidity in the present population.

FAMILY PLANNING METHODS

In the present study, data on acquired immune deficiency syndrome (AIDS) were not collected. However, it is found that the awareness of AIDS is very high in both rural (99.30%) and urban (99.46%) areas. Similarly, awareness of family planning methods is very high in both rural (94.52%) and urban (97.81%) areas. As for adoption of family planning methods, it is found to be higher in urban women (46.21%) than in rural women (42%), despite the absence of statistical significance. Pooling the data for rural and urban areas, about 41.76% of mothers have adopted family planning methods in the present population. The present study also indicates that condoms and loop are the most common

methods used in both rural and urban areas. It is further observed that private and Government primary health centers or hospitals are the main sources of contraceptive methods.

Of the different factors considered in the present study, adoption of family planning methods is found to be positively associated with maternal age, household income, maternal education and paternal education. When only these variables are included in the model of logistic regression analysis, it is found that the effects of paternal education disappeared. The present study indicates that adoption of family planning methods in the present population is mainly correlated with age of mothers (i.e., older mothers are likely to adopt family planning methods more readily than younger mothers especially below 24 years), maternal education (i.e., adoption is likely to be higher in those women with higher educational level) and household income (i.e., adoption of family planning methods is likely to be higher in those women with higher household income). The present findings are, therefore, consistent with those studies conducted in many developing countries, which indicate that maternal age and education are the important factors influencing adoption of family planning methods (Vlassoff, 1990; Moreno and Goldman, 1991; DeSilva, 1991).

Key Points

1. Awareness of AIDS and family planning methods is very high in both rural and urban areas.
2. The adoption of family planning methods is higher in urban women than in rural women, despite the absence of statistical significance.
3. Condoms and loop are the most common methods used in both rural and urban areas.
4. Private and Government primary health centers or hospitals are the main sources of contraceptive methods.
5. Of the different factors considered in the present study, adoption of family planning methods is positively associated with maternal age, household income and maternal education.

CHILDREN'S HEALTH AND NUTRITIONAL STATUS

In Chapter V, we have presented our findings on selected indicators of children's health and nutritional status in terms of infant and juvenile mortality, anthropometric indicators of nutritional status, immunization coverage and self-reported morbidity. We shall discuss our findings on these indicators of reproductive health under the following sections:

Infant and Juvenile Mortality

The infant mortality rate is higher in rural (2.09%) than in urban (1.02%) areas, although it is not statistically significant. Pooling the data for rural and urban areas, the infant mortality is 1.57% or 16 per 1000 live-births. It is similar to that reported for Kerala (IIPS, 2000) and lower than Pnars (4.20%) of Jatinga (Khongsdier *et al.*, 2001), Lotha Naga (2.75%) of Nagaland (Benthirung *et al.*, 2005) and Hmars (2.83%) of Mizoram (Varte, 2006). On the other hand, the juvenile mortality is very low in both rural (0.37%) and urban (0.26%) areas. It shows that both infant and juvenile mortality rates are moderately low in the present population as compared to Pnars (2.10%) of Jatinga (Khongsdier et al., 2001), Khasi (2.33%) of Meghalaya (Mukherjee, 2002) and Hmars (1.90%) of Mizoram (Varte, 2006). There is a possibility that the present study might have under-represented the information on infant and juvenile mortality. We hope that future in-depth studies will throw more light on the patterns of infant and juvenile mortality among the Loi Community.

Key Points

Both infant and juvenile mortality are low as compared to other populations in Northeast India.

Morbidity as Reported by Parents

The term "morbidity" in this study was defined simply in terms of the number of 'days ill' and/or 'days lying in bed' due to any health problems in the last four weeks before the survey. It is observed that the rural-urban differences in the prevalence of health problems among girls are not clearly consistent. The prevalence of cold and respiratory disorders is higher in urban girls (5.29%) than in rural girls (3.98%), whereas the prevalence of intestinal disorders is higher in rural girls (5.97%) than in urban girls (4.33%). Nevertheless, the rural-urban difference in the overall prevalence of morbidity among girls

is not statistically significant, although it is slightly higher in rural girls (11.44%) than in urban girls (10.58%).

Unlike in the case of girls, the prevalence of the three different types of self-reported morbidity is higher in rural than in urban boys. Similarly, the overall prevalence of morbidity is higher in rural boys (13.57%) than in urban boys (7.29%) and the difference is statistically significant. The estimated odds ratio (OR) at 95% confidence interval (CI) indicates that the rural boys were about 2 times higher in morbidity than their urban counterparts.

Using logistic regression analysis, it is found that morbidity is positively associated with under-nutrition ($b = 1.578 \pm 0.266$, $p < 0.01$) and negatively associated with household income ($b = -0.772 \pm 0.188$, $p < 0.01$). Thus, we may conclude that under-nutrition and household income are important factors in influencing morbidity patterns among the Loi Children of the present study.

Key Points

1. There are no significant differences between rural and urban areas with respect to the overall prevalence of self-reported morbidity in girls. However, the prevalence of cold and respiratory disorders is higher in urban girls than in rural girls, whereas the prevalence of intestinal disorders is higher in rural girls than in urban girls.
2. Rural boys were about 2 times higher in morbidity than their urban counterparts.
3. Under-nutrition and household income are likely to be important factors in influencing morbidity patterns among the Loi Children.

Anthropometric Indicators of Nutritional Status

In the present study, we have taken three important anthropometric indices, i.e., weight-for-age, height-for-age, and weight-for-height for assessing the nutritional status of the children aged 3-7 years, following the cut-off points given by the WHO expert groups (1983, 1995). We have also made an attempt to correlate these indices with certain socio-economic variables such as household income, family size, place of residence, maternal and paternal education, morbidity status, immunization status, etc.

It is found that the prevalence of underweight as indicated by weight-for-age is higher in rural (26.13%) than in urban (21.88%), that is, about 1.26 times higher in rural than in urban boys, despite the absence of statistical difference. Similarly, the prevalence

of underweight among girls is higher in rural (28.86%) than in urban (23.56%) areas, despite the absence of statistical difference. It is also observed that the overall prevalence of underweight is also higher in girls than in boys for both rural and urban areas, despite the absence of statistical difference.

With respect to the prevalence of stunting as indicated by height-for-age, it is about 35.68% in rural boys and 21.35% in urban boys. The risk of being stunting in rural boys is more than 2 times as compared to urban boys. As for girls, the overall prevalence of stunting is also higher in rural (37.81%) than in urban (35.58%) areas, despite the absence of significant difference. It is also observed that the overall prevalence of stunting is higher in girls than in boys for both rural and urban areas.

The prevalence of wasting among boys (as indicated by weight-for-height) is also higher in rural (6.53%) than in urban (3.13%) areas. The same is true among girls in which the prevalence is higher in rural (7.96%) than in urban (4.33%) areas, although it is not statistically significant. It is also observed that obesity also exists in both boys and girls, and the prevalence is higher in urban than in rural areas.

In order to understand the effects of biosocial factors on the nutritional status of children in the present population, an attempt has been made to group them into two major groups, namely, normal and undernourished. Undernourished children refer to those children who suffered from at least one of the three nutritional problems, namely, underweight, stunting and wasting as indicated by anthropometric indicators. The overall prevalence of under-nutrition, as defined above, is found to be much higher in girls (44.74) than in boys (36.32%) and the difference is statistically significant. The overall prevalence of under-nutrition is also significantly higher in rural (44.50%) than in urban (36.75%) and the difference is statistically significant. Using logistic regression analysis, it is found that under-nutrition is positively associated with sex (i.e., higher in boys) and morbidity and negatively associated with family size and household income.

Key Points

1. The overall prevalence of under-nutrition is significantly higher in rural than in urban boys. It is also significantly higher in girls than in boys.
2. Under-nutrition is positively associated with sex (i.e., higher in boys) and morbidity and negatively associated with family size and household income.

Immunization Coverage

Vaccination of children against six preventable diseases, namely, tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis, and measles, has been a very important part of the child health care system in India. The Expanded Programme on Immunization (EPI) was initiated by the Government of India in 1978 with a view to reducing morbidity, mortality, and disabilities from these six diseases by providing free vaccination services to all eligible children. Immunization against poliomyelitis was introduced in 1979–80, and tetanus toxoid for school children was added in 1980–81. Immunization against tuberculosis (BCG) was brought under the EPI in 1981–82. The latest addition to the Programme was vaccination against measles in 1985–86 (Ministry of Health and Family Welfare, 1991).

In the present study, we have considered four important vaccinations, namely, BCG, measles, polio and diphtheria. It is found that the rural-urban differences are inconsistent and statistically insignificant. It is observed that the overall immunization rate (i.e., the number of children who received at least two vaccinations) is also higher in rural (60.20%) than in urban (57.21%), although it is not statistically significant. On the other hand, the immunization rate in boys is higher in urban (69.27%) than in rural (65.83%) areas. But the differences are not statistically significant.

As for sex differences, the immunization rate is higher in boys than in girls for both rural (girls = 60.20%, boys = 65.83%) and urban (girls = 57.21%, boys = 69.27%) areas. The differences are found to be statistically significant in urban areas. Although these findings indicate to certain extent the existence of gender bias with respect to immunization coverage, the logistic regression analysis indicates that the sex differences disappeared after adjusting for other covariates. It is found that immunization is negatively associated with morbidity status and family size. It is positively associated with maternal education and paternal education.

Key points

1. It is found that the rural-urban differences are inconsistent and statistically insignificant.
2. The immunization rate is higher in boys than in girls for both rural areas, although the differences disappeared after adjusting for other covariates.

3. It is found that immunization is negatively associated with morbidity status and family size. It is positively associated with maternal education and paternal education.

CONCLUDING REMARKS

Rural-urban differences

Rural populations are generally older, poorer, and have lower levels of education than their urban counterparts. There are fewer hospitals and physicians in rural communities; the time taken to travel to health care providers is often greater and public transportation less available. These problems may be magnified in rural areas far distant from any urban center even in developed countries like the USA (Ormond *et al.*, 2000). It may be hypothetically assumed that the situation is more aggravated in developing countries like India (IIPS, 2000). However, the present study indicates that rural-urban differences with respect to maternal and child health indicators are by and large not significant, except in few cases. The main reason is that the differences in socio-economic conditions like education and income are controlled while analyzing the rural-urban differences with respect to different maternal and child health indicators. In other words, the rural-urban differences in health indicators are mainly due to the differences in socio-economic conditions especially in terms of education and economic condition. It may be mentioned that illiteracy rate is about 37.82% and 18.21% in rural and urban areas, respectively (Table 3.1). Similarly, the percentage of women belonged to the low income group is about 48.08% in rural areas and 39.62% in urban areas. Thus, the socio-economic condition is poorer in rural women than in urban women. The absence of statistical differences between rural and urban areas in certain health indicators is due to the control of socio-economic factors in our analysis.

However, the absence of statistical differences with respect to demographic indicators like fertility, reproductive wastage and infant mortality is not mainly due to differences in socio-economic condition between rural and urban areas. Instead, other factors like family planning programmes and health services may play important role. For example, age at marriage is significantly higher in rural than in urban areas. The present study indicates that awareness of family planning methods is very high in both rural and urban areas. There is also no significant difference between rural and urban areas with

respect to adoption of family planning methods. Similarly, it is found that that there is no significant difference between urban and rural areas with respect to awareness and attendance of ANC services. Thus, it is likely that the absence of rural-urban differences with respect to in fertility and mortality (infant and reproductive wastage) is mainly due to the successful family planning programs and health care services in Manipur as compared to other states in Northeast India (IPPS, 2000).

Caution should be, however, taken while interpreting these findings on demographic indicators. It does not mean that education or economic condition is not related to fertility and reproductive wastage. It is observed in the present study that maternal and paternal education and household income are significantly related to fertility (i.e., when data were pooled together for both rural and urban women). Similarly, maternal education plays a very important role in regulating reproductive wastage in the present population. Thus, socio-economic inequality between rural and urban areas does not seem to bring about differences in fertility and mortality (infant and reproductive wastage) among the Lois of Manipur. This is perhaps due to the success of family planning programs and public health services.

The success of family planning programs and public health services can also be assessed in terms of obstetric morbidity, delivery complications, anemia and self-reported morbidity, and immunization coverage. The present study failed to get any significant differences between rural and urban areas with respect to these health indicators. Thus, although socio-economic inequality does exists between rural and urban areas, it is likely that successful implementation of planning programs and public health services would bring about a balance between rural and urban areas in respect of certain health indicators among the Loi women and children of the present study. Earlier studies have also suggested that greater women's autonomy, involvement of social organizations, political participation in implementing health care services, increased standard of living are operating synergistically to lower fertility and mortality in Manipur (Kumar, 1995).

With respect to nutritional status, over-nutrition among the Loi community is likely to be a major nutritional problem especially in the next decade or so. There are also significant differences between rural and urban areas with respect to the prevalence of overweight among the Loi women. On the other hand, under-nutrition is the major health problem among children. The overall prevalence of under-nutrition among children is

significantly higher in rural than in urban areas. The prevalence of overweight is also higher in rural than in urban areas, although it is not statistically significant. The rural-urban difference in BMI or nutritional status is mainly because of the differences in socio-economic factors like education and economic conditions. In addition, individuals in urban areas are likely to be more sedentary in lifestyles with less physical activity, and thereby they are likely to be overweight.

Anthropological Implications

The present study has clearly revealed that maternal and child health status in the higher socio-economic groups, whether in terms of educational or income level, is better than that in the lower ones. On the basis of these findings, the most anthropological question is that whether being in poor socio-economic condition is also indicative of being victims of natural selection? Natural selection acts primarily at the individual level. The simple definition of natural selection given by Darwin (1859) is the "preservation of favourable individual differences and variations, and the destruction of those which are injurious." He further clarified that "under the term of "variations," it must never be forgotten that mere individual differences are included." Thus, natural selection operates primarily at the individual level through differential survival and reproduction. The aggregate or average differential survival and reproduction of a given number of individuals may be considered its action at a group or population level.

Like the present study, there is considerable evidence that the health and nutritional status of the poor is worse than is the rich. Mortality rates due to malnutrition, infections and other causes of deaths are much higher in the lower socio-economic classes (Khongsdier, 2006). The significance of these inequalities also influenced the writings of Malthus (1803) and Darwin (1871, 1859). According to Malthus (1803), the "constant tendency in all animated life to increase" would prevent any permanent amelioration of poverty in the lower classes. In Central and South Asia, the positive checks including epidemics and consequences of "indigence and bad nourishment" would fall heavily on those in the lowest socio-economic strata "before any considerable degree of want had reached the middle classes of the society" (Malthus, 1803). Acknowledging this important observation of Malthus, Darwin (1871) wrote, "As all animals tend to multiply beyond their means of subsistence, so it must have been with the progenitors of man; and this

would inevitably lead to a struggle for existence and to natural selection." Although Darwin did not say that natural selection is stronger among the poor, he also observed the "greater death-rate of infants in the poorest classes ... as well as the greater mortality, from various diseases, of the inhabitants of crowded and miserable houses, at all ages" (Darwin, 1871). It was Franz Boas (Boas, 1938) who argued that natural selection in humans operates primarily through social stratification. In addition, malnutrition, associated with poor environmental conditions in the lower socio-economic strata, is suggested to be a strong force of natural selection especially among children and reproductively-active women (Segraves, 1977). Thus, the view that socio-economic inequality mediates the process of natural selection in human populations seems to have originated with Darwin himself (Strickland & Tuffrey, 1997).

Natural selection is a blind natural force that preserves the beneficial variations and eliminates the injurious ones. The process of preserving the beneficial variations is also known as the *survival of the fittest* in the *struggle for existence*. According to Malthusian and Darwinian points of view, the struggle for existence, or competition for survival, is due to the increase in population beyond the means of subsistence. The short supply of resources, therefore, increases competition in different forms including social stratification in which "members of the privileged class may own even up to or over 10,000% of what a poor person owns" (Cohen, 1998). The high prevalence of malnutrition and infections is a clear evidence of poor access to adequate nutrition and health amenities among the lower socio-economic classes. From this point of view, one may argue that social stratification mediates natural selection in human populations in the form of malnutrition and infections, which ultimately lead to higher morbidity and mortality in the lower strata of social stratification. However, this argument is based simply on differential survival or *survival of the fittest* due to limited resources mediated by social stratification.

Natural selection or *survival of the fittest* also occurs whenever two or more individuals of distinct genotypes transmit their genes to the succeeding generations at different rates, despite the absence of limited resources (Birch, 1957). Any population is capable of increasing in number only when the progeny are able to survive and reproduce from generation to generation. Considering the findings on differential fertility and mortality in the present study, one may argue that reproductive success is lower in the higher socio-economic groups than in the lower socio-economic groups because fertility

and mortality rates are lower in the former than in the latter. Indeed, there might not be a large difference between low and high socio-economic classes in differential reproduction because a higher mortality rate among the low socio-economic class is compensated for by a higher fertility rate. There is considerable evidence that fertility rates are higher in the lower socio-economic groups than in the higher ones. "This situation is undesirable, irrespective of any genetic considerations. People who should be able to provide the best environment for the physical and mental development of their children produce fewest progeny" (Dobzhansky, 1962).

According to the adaptive systems theory, parents living in risky and uncertain environment maximize the current reproduction in terms of the *quantity* of offspring to minimize the risk of lineage extinction because of high mortality; while parents living in good environmental conditions maximize the *quality* of their offspring by reducing the quantity of the current reproduction (Chisholm and Burbank, 2001). Consequently, the future reproductive success of the parents under good environmental conditions is higher than that of the parents under poor environmental conditions because the high quality offspring are more likely to survive and reproduce from generation to generation.

In the present study, although we observed higher fertility and mortality in the lower socio-economic groups, we were not concerned with the case study or longitudinal study of the quality of offspring in the lower and high socio-economic groups of the Loi population. More studies are needed to know whether or not the higher fertility and mortality rates in the lower classes are a form of plasticity to minimize the lineage extinction at the cost of high mortality? There is also a possibility of minimizing the lineage extinction at the expense of individual physical disadvantages (Strickland and Tuffrey, 1997). However, such a form of plasticity, if any, is because of necessity rather than for long-term benefits of populations (Khongsdier, 2006). Natural selection that operates in the lower strata of social stratification does not result in a long-term beneficial adaptation. As for the upper class, Harrison (1998) points out, "any physiological ability facilitating access to better environments will be strongly favoured through the greater success, reproduction and offspring survival which the better environments are likely to promote . . . . Darwinian fitness will tend to be highest in the upper class, especially in the absence of contraception, and physiological ability can influence the probability of being in those classes" through its effects on health and functional capability. Despite

improvement in agricultural productivity in the 20th century, millions of people in developing countries still remain poor and undernourished because food is "neither produced nor distributed equitably" (WHO, 2000a). This problem remains a major setback to the "recognized fundamental human right to adequate food and nutrition, and freedom from hunger and malnutrition, particularly in a world that has both the resources and knowledge to end this catastrophe" (WHO, 2000b).

POLICY IMPLICATIONS

The present study indicates that almost health indicators are better in Loi population of Manipur as compared to those reported for populations in Northeast India. Accordingly, if this trend is similar to all populations in the state, Manipur should be considered a model state in Northeast India as far as maternal and child health indicators are concerned. For example, the infant mortality in the present population is slightly lower than that reported for Kerala (IIPS, 2000). It is also observed that awareness of AIDS and family planning programs is very high in the present population, although the rate of adoption of modern contraceptives needs to be intensified. Similarly, immunization coverage is better in the present population of Manipur as compared to other states in Northeast India.

The major concern, according to the findings of the present study, is the tendency to high prevalence of overweight especially in urban areas needs to be checked with different preventive measures including increased physical activity and dietary measures. Recent reviews has revealed that although under-nutrition remains a major health problem in many developing countries, over-nutrition is also emerging with the improvement in socio-economic condition and/or increasing urbanization (Popkin, 2002, Khongsdier, 2005c). Consequently, the double burden of under- and over-nutrition exerts considerable impact on the economy and health system in many developing countries. In general, many countries in Asia are in this situation due to "changing dietary pattern towards energy-dense and high fat diets, together with a more sedentary lifestyle arising from increasing urbanization" (Florentino, 2002). The increasing urbanization, changes in standards of living, dietary patterns and occupational work patterns are the key factors to risks of the epidemic of obesity and associated morbidity and mortality. Therefore, the spread of overweight and obesity in the Loi population needs to be monitored and prevented, but it should not be done at the expense of the efforts to alleviate under-nutrition. It is observed

in the present study that the prevalence of under-nutrition in children is still high especially in rural areas. The present suggests that child welfare programs like integrated child development schemes in the state needs to be implemented with greater intensity in the near future.

Another implication for policy making is that the prevalence of under-nutrition is much higher in girls than in boys especially in rural areas. Also, the rate of immunization coverage is higher in boys than in girls. It is often argued that discrimination against females is very high in South Asian populations because of the patrilineal system of societies. In Northeast India, recent analysis on the nutritional status of the adolescents in both patrilineal and matrilineal societies did not confirm such an observation (Khongsdier *et al.*, 2005). It is observed that the nutritional status is better in females than in males in both matrilineal and patrilineal societies. However, the present findings among the Loi children seem to be more corroborated with those observed in other parts of India and many other populations of Southeast Asia where the nutritional status of boys are far better than that of girls. Earlier studies have suggested that women in Manipur enjoy higher status (Kumar, 1995). It is also suggested that bride price is still practiced in the Loi society, thereby enhancing the status of women especially those in the lower socio-economic group (Ghosh and Ghosh, 1997). Accordingly, it is expected that the nutritional status and immunization coverage should not be different between the sexes of children. On the contrary, the present study suggests that more attention should be given to improve the immunization and nutritional status of children, especially that of female children below 7 years of age. As for immunization, it is likely to be associated with socio-economic conditions like parental education. Therefore, educational policy especially relating to increased female education should be more intensified.

LIMITATIONS

The present study on maternal and child health has many limitations. The covariates taken in the study are also limited. But we hope that the findings of the study will stimulate different research questions that enhance our knowledge of the health and well-being of mothers and children in Northeast India. The present study is limited to one population of Imphal valley. It indicates that almost health indicators are better as compared to those reported for populations in Northeast India. However, it is not clear whether this trend is

similar to all populations in the state, especially among tribal populations in hill areas of the state. More studies are needed to carry out in other populations especially among tribal populations to have a clear idea of the health and nutritional status in the state of Manipur.

The present study is not concerned with sex discrimination, which is generally reported for Indian populations. It simply indicates that the nutritional and immunization status is better in boys than in girls. More studies are needed to carry out to understand whether there exists sex discrimination in different population of Manipur.

CHAPTER VII

SUMMARY

In their attempt to understand human variation and evolution, anthropologists have also realized the need to understand the relationship between human biology and culture, especially to those aspects relating to health and nutrition, and various socio- cultural factors. The study of genetic diversity and its linkage, for example, with health and culture has become a major interest in biological anthropology. In fact, it is now believed that human biological processes are largely influenced by various socio- cultural aspects of the human society. Thus, it is important on the part of physical anthropologists to undertake such studies to understand not only the process of human evolution and variation but also the health and well-being of human populations.

This thesis is an attempt to deal with the reproductive and child health among the Lois of the Imphal Valley with a view to understanding how certain indicators of the reproductive and child health are associated with demographic, biological and socio-economic variables in both rural and urban areas. According to the United Nations (UN, 1994), "Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes." It includes the right of access to appropriate health-care services that will enable women to go safely through pregnancy and child birth and provide couples with the best chance of having a healthy infant. It also includes sexual health which is concerned with the enhancement of life and personal relations and not merely counseling and care related to reproduction and sexually transmitted diseases.

There are different parameters or indicators of child and reproductive health. From the biological anthropological point of view, demographic variables (e.g., fertility, mortality and reproductive wastage), antenatal care, delivery characteristics and adoption of family planning methods, anemia, maternal and child morbidity (self-reported illness), immunization of the children, breast feeding and supplementation, educational and health

facility, knowledge of sexually transmitted diseases (STDs), nutritional anthropometry of the mothers, physical growth and nutritional status of the children may be considered as important indicators of the child and reproductive health. An attempt to understand the relationship of these indicators with various cultural, social and economic factors may be very helpful in understanding the reproductive and child-health of a population.

OBJECTIVES

Our brief review of literature (which is given Chapter II of the thesis) has revealed that various biological, socio-cultural, and environmental factors have a great influence on reproductive and child health. It has also revealed that maternal mortality and morbidity, demographic variables and family planning, anemia, nutritional status, growth and development of children are widely used as the indicators of reproductive and child health. Such studies on the reproductive and child health are very limited in Northeast India particularly in the populations of Manipur, except those carried out by the National Family Health Survey at the state level (IIPS, 2000).

Therefore, we have undertaken a reproductive and child health study among the Lois of Imphal Valley in West district of Manipur with the following objectives:

1. To understand the reproductive and child heath of both rural and urban areas in term of demographic variables, maternal morbidity, hemoglobin level, body dimensions, family planning services and practices, antenatal care and immunization coverage.
2. To assess the nutritional status of children aged 3 to 7 years, using anthropometric measurements and indices.
3. To understand the effects of biological and socio- economic factors on the reproductive and child health.

MATERIALS AND METHODS

Chapter III of the thesis deals with the materials and methods adopted for the present study. They may be briefly presented as follows:

Sampling Method

The present study was carried out among the Lois in Imphal West District of Manipur during the month of March to September of 2003 in both rural and urban settings. There are eight Loi areas in Manipur valley (TDD, 1994), of which four villages are in Imphal

West District. The data for the present study were collected from three areas (37.50% of total villages), namely, Sekmai in urban area, Koutruk and Phayeng in rural areas. These three areas were selected according to simple random sampling by using random numbers (Snedecor and Cochran, 1967). According to this sampling method, the list of eight villages and their population in Imphal District was prepared based on the information from the District Gazetteer (TDD, 1994).

No random sampling was applied for selection of subjects/informants from each of the selected villages due to operational difficulties in the field. An attempt was made to cover 600 households, i.e., about 45% of the total 1330 households in all three selected villages. The study included 625 married women (aged 15-49) who were willing to co-operate with the present work.

Demographic Data

The nature of demographic data collected for the present study was based on those parameters suggested by the World Health Organization Working Group (WHO, 1964, 1968; Mahadevan, 1986). The entire demographic data were collected through pedigrees and schedules from all the six hundreds households in the three villages, viz., Sekmai, Koutruk and Phayeng. Information on age, sex, marital status, tribe, religion, occupation, income, education, community affiliation, place of birth, place of residence, etc. was collected from the heads of the households or elder members who were capable of furnishing all the relevant information as per household schedule.

The fertility schedule was completed by filling-in the information on the number of conceptions, number of live births, number of reproductive wastages (abortion and still births), sex, present age, age at death and birth order from all the ever married women. Pedigrees were also collected for cross-checking of data on reproductive history of the mothers. Sometimes, information given by the mothers was cross-checked from their respective husbands. It may be mentioned that great difficulties were experienced in the assessment of age, particularly that of the elderly women because many of them were not aware of their real age. Consequently in such cases, the age was estimated with the help of other persons in the household/village, or with reference to local important events and the age of the individuals who looked to be in the same age groups. So, there could be some mistakes, in some cases, in the estimation of age.

Data on Family Planning

Information about knowledge and use of contraceptive methods were collected from 549 married women (aged 15-45 years) through structured schedules. The nature and types of data were based on those suggested by the Ministry of Health and Family Welfare (2000), which are as follows.

1. ***Awareness of Family Planning***: These included questions related to knowledge of contraceptives/family planning methods.
2. ***Adoption and Methods of Family Planning:*** These included questions about adoption of contraceptives and duration of use. The contraceptive methods are classified into *modern* and *traditional* categories. The modern contraceptives methods include pill, intra uterine device (IUD) like copper T, condom, female sterilization and male sterilization. The traditional contraceptives methods include rhythm or safe period, withdrawal, use of herbal medicines, etc.
3. ***Sources of Family Planning Methods:*** These included questions about the sources of modern contraceptives methods. The sources are divided into two categories, namely, *Hospital sources* (which included both government and private hospitals) and *Pharmacies and shops*.

Data on Maternal and Child Health Care

Data on maternal and child health care were collected through schedules similar to those for the National Family Health Survey-2 (NFHS-2) (IIPS, 2000). Information was collected on pregnancy and birth histories, details of antenatal and delivery care received during the last pregnancy for each woman (aged < 45 years). Information was collected from 549 women regarding health problems during their pregnancies and whether they received any antenatal check-ups. Women who received antenatal check-ups were asked about the timing of the first antenatal check-up, the total number of check-ups. In addition, the respondents were asked whether they received tetanus toxoid injection and iron/folic acid tablets or syrup during their visits to antennal care centres. In short, an attempt was made to follow as far as possible those guidelines given by the National Reproductive Health Programme (MHFW, 1997).

Data on immunization of children (aged 3-7 years) were also collected from the parents with special reference to six preventable diseases, namely, tuberculosis, diphtheria,

pertussis, tetanus, poliomyelitis and measles. Parents were asked whether they had the immunization card of their children. If card was available, the dates when the child received vaccinations against each disease were recorded. Parents' report on vaccinations was also recorded although record on the card was unavailable. If the mother could not show a vaccination card, she was asked whether the child had received any vaccinations.

Anthropometric Data

Standard techniques of measurements described by Weiner and Lourie (1981) and Sen (1994) were followed while taking the measurements of weight, height and sitting height on adults and children. For assessing the nutritional status of children, we had taken three anthropometric indices, namely, weight-for-age, height-for-age and weight-for-height - which are considered as the indicators of nutritional status. These indices were derived as z-scores of the international standard or reference, i.e., the growth reference of the WHO/U.S. National Centre for Health Statistics (WHO, 1983, 1995). Body mass index (BMI = weight in kg/height in meter squared) was used for assessing the nutritional status of women by following the standard cut-off points (WHO, 1995).

Data on Morbidity and Hemoglobin Level

Data on haemoglobin content of 551 adults were collected using Sahli's Haemometer by following standard techniques (WHO, 1980). The cut-off points of 13.0 g/dl and 12.0 g/dl were taken for screening the adult men and non-pregnant women, respectively (WHO, 1968). The cut-off point of 11.0 g/dl was used for assessing the anemic status of pregnant women. Data on morbidity were based on "self-reported illness experience" of a subject as generally adopted in surveys, which did not involve a clinician (Strickland and Ulijaszek, 1993; Garcia and Kennedy, 1993). The term "morbidity" in this study was defined simply in terms of the number of 'days ill' and /or 'days unable to work' in the last four weeks before the survey. Each subject included in the study was asked whether or not she had been ill at any time in the last four weeks? If the answer was yes, she was asked how many days had she been in bed or unable to work due to illness? A subject who reported at least two days ill was classified as being "ill". The study was symptom-based in which the reported symptoms were grouped into five categories as suggested in many studies (Strickland and Ulijiaszek, 1994; Strickland and Tuffey, 1997; Sadana, 2000).

SOCIO-ECONOMIC CATEGORIES

In the present study, three important socio-economic variables were taken into consideration. These include religion, monthly income of the households and educational level. These socio-economic variables were classified arbitrarily into different groups and/or categories to understand their influence on demographic characteristics, maternal health and nutritional status of the study population. Our classification may be briefly described as follows:

Income groups: Data on household income were collected directly from the head of the household and they were cross-checked taking into consideration some aspects of socio-economic conditions like housing condition, types of occupation, land holding, and monthly expenditure. The interval estimation based on standard deviation of the per capita monthly income of household was adopted for classifying the three economic groups (Khongsdier, 1997), which is as follows:

Above ($\bar{X}$ + 4SD/√N) = High income group (HIG)

($\bar{X}$ − 4SD/√N) to (Mean + 4SD/√N) = Middle income group (MIG)

Below ($\bar{X}$ − 4SD/√N) = Low income group (LIG)

Where N stands for the number of households and $\bar{X}$ is the average monthly per capita income of the households. In the present study, the average per capita monthly income of the 600 households of both rural and urban populations was found to be Rs.831.50 /-with a standard deviation (SD) of Rs.540.16. Thus, following the above interval method, the households with per capita monthly income of below Rs.743/- were classified as LIG, while the range of Rs.743 /- to Rs 919.02/- were considered as MIG, and those household with per capita monthly income of above Rs.919.02/- were classified as HIG.

Educational Level: The data on educational attainment of individuals in the present study were arbitrarily classified as follows: The category **Illiterate** includes those individuals who were unable to read and write and those who had no education but could read or write their names. The individuals who attended school up to standard V were grouped into **Primary** level of education. The individuals with educational level from VI to X standard were grouped into **Secondary level,** and the individuals with educational standard of more X-standard are included in the category of **Higher Secondary level** of education.

Family Size: The family size was classified into three categories. The individuals who lived in a household with less than 5 family members were considered as having a **Small**

Family Size. The **Average/Medium Family Size** includes those individuals who lived in a household with 5-6 family members. The individuals who lived in a household with more 6 family members were grouped in the category of **Large Family Size**.

STATISTICAL ANALYSES

The data collected for the present study are quantified and analysed statistically, using SPSS Window software, in which the level of significance was set at 5%. The data are presented in terms of means, standard deviation, standard error and proportions or percentages. The differences between two means were tested, using t-student test (2-tailed), while the differences between more than two means were determined, using one-way analysis of variance (ANOVA). Analysis of covariance was also carried out for testing the differences among means, allowing for the effects of other covariates. The differences between proportions were tested, using chi-square test. Multiple regression analysis was also carried out for understanding the effects of socio-economic factors on demographic and health parameters that are not dichotomous in nature. Logistic regression analysis was used for analyzing the effects of socio-economic factors on health and nutritional indicators that are dichotomous in nature, e g., whether under-nourished or not, or whether or not the respondent adopted family planning methods. In other words, using logistic regression analysis, we can predict whether or not adoption of family planning methods, for example, depends on maternal education after adjusting for the effects of age, income level and religion. Depending on the types of models, logistic regression is useful for many ways. In the present study, logistic regression coefficients were also used to estimate odds ratios for each of the independent variables in the model.

FINDINGS

The findings of the present study are presented in Chapters IV and V. Chapter IV deals with the maternal health and nutritional status, whereas Chapter V deals with the child health and nutritional status. The findings on maternal health and nutritional status may be briefly presented as follows:

Demographic Indicators

In the present study, we have observed that the Loi population is *progressive* in both rural and urban areas, that is, more than 40% of the total population belonged to the age group

0-14 years. The overall sex ratio does not deviate significantly from the ideal sex ratio of 1:1 in both rural and urban areas. The same is true in the reproductive age group, i.e., 15-49 years, suggesting that there is no sex difference in mortality during reproductive age for both rural and urban populations. There is also no significant difference between rural and urban areas in the proportion of females who are married at the age of 24 years and below. However, the mean age at marriage is significantly higher in the urban women (21.87± 0.27 years) than in the rural women (20.95±0.23 years). The same is true with respect to the mean age at first child birth. It is found that the mean age at marriage among the Loi women is higher than those reported for many populations of Assam (Sengupta and Gogoi, 1995; Gogoi, 2002) and Meghalaya (Khongsdier *et al.*, 2001; Khongsdier, 2005).

Fertility Differentials

1. It is found that the mean numbers of live-births to mothers of all ages is 2.56 ± 0.06. It is more or less similar for both rural mothers (2.61 ± 0.09) and urban mothers (2.50 ± 0.85). The age-specific fertility rate (ASMFR) reaches its peak when the mothers are aged 25-29 years (Figure 4.3). The total marital fertility rate (TFMR) is found to be 3.98 for rural and 3.87 for urban areas. Pooling together for both rural and urban areas, the TMFR is 3.91. The fertility rate among the Lois is lower than that reported for many populations in Northeast India (Limbu and Khongsdier, 2000; Murry *et al.*, 2005; Khongsdier, 2005; Varte, 2006).
2. In addition to adoption of family planning methods, age at marriage and maternal education, the important factors affecting fertility rate among the Loi women is the economic condition as measured by household income. The effect of household income on live-births is significant even after adjusting for other factors. The significant effect of the household income on fertility rate in this population is likely to be related to the contention that people belonging to the higher economic groups are more conscious of the socio-economic welfare of their children. It is likely that they have higher aspiration for better education and higher economic status, thereby reducing the birth rate in order to provide their children with such facilities (Mukherjee, 2002; Varte, 2006).

Reproductive Wastage

1. The prevalence of reproductive wastage (i.e., abortions and still births) is 6.32% and 4.88% in rural and urban areas respectively. Although it is higher in rural areas, the difference is not statistically significant. Pooling the data together for rural and urban areas, the overall prevalence of reproductive wastage among the Lois is 5.62%.
2. This rate of reproductive wastage among the Loi women is similar to that reported for the Nepalese (5.92%) of Manipur (Singh, 2006) and Semsa (5.90%) of Assam (Limbu and Khongsdier, 2000) but lower than that reported for the Meitei (7.85%) of Manipur (Singh, 2006) and Munda (8.83%) of Assam (Gogoi, 2002), Pnar (6.18%) of Jatinga (Khongsdier *et al.*, 2001), Khasi (8.16%) of Meghalaya (Mukherjee, 2002) and higher than Hmars (4.11%) of Mizoram (Varte, 2006).
3. The prevalence of reproductive wastage is associated with generation of mothers and education when other factors like residence, religion, household income, age at marriage, family size and ANC visit are also included in the regression model. In other words, older women are likely to have higher prevalence of reproductive wastage than younger women. It is also found that mothers without education or with lower educational levels are likely to have a higher prevalence of reproductive wastage.

ANTHROPOMETRIC INDICATORS OF NUTRITIONAL STATUS

1. The nutritional status of women was assessed by using body mass index (BMI), which is derived from anthropometric measurements of body weight and height as internationally recommended (WHO Working Group, 1986; WHO, 1995). It is found that the mean BMI is significantly higher in urban (22.28±2.59 kg/m^2) than in rural (21.81±2.81 kg/m^2) areas ($t = 2.17$, $p < 0.03$).
2. Considering the cut-off point of 18.5 kg/m^2 for screening undernourished individuals (Ferro- Luzzi *et al.*, 1992; WHO, 1995), the overall prevalence of underweight is higher in rural (14.74%) than urban (10.54%) areas, although it is not statistically significant. The over prevalence of underweight is 12.64%, which is lower than those reported for several populations of Northeast India, such as Caste groups like Brahmins, Kalitas, Jogis, Kaibartas and Hinduised groups like Ahoms, Kochs and Rajbhanjis (Khongsdier, 2001). They are also lower than the tribal groups like Lalungs, Miris (Khongsdier, 2001), War Khasis (Khongsdier, 2002) and Hmars of

Mizoram (Varte, 2006). In short, it indicates that the nutritional status in the present populations is better than many populations in Northeast India.

3. Using the cut-off point of 23.0 kg/m^2 for screening overweight individuals, it is also found that the prevalence of overweight is significantly lower in rural mothers (23.08%) than in urban mothers (36.10%). This indicates that overweight is likely to be a major nutritional problem especially in the next decade or so.
3. Logistic regression analysis indicates that underweight is significantly associated with only two variables, namely, pregnancy status and household income. As for overweight, it is positively associated with cormic index and household income. Of socioeconomic factors, we may suggest that household income is very important factor for regulating underweight and overweight in women of the present study.

HEMOGLOBIN CONTENT

1. The overall mean hemoglobin level is 11.78±1.02 g/dl. There are no significant differences between age groups and between urban and rural areas. There are also no significant differences between age groups. The mean hemoglobin content in the age group 15-29 years is 11.86±1.04 g/dl for rural and 11.70±0.97 g/dl for urban areas. In the age group 30-49 years, the mean is 11.79±0.97 g/dl for rural and 11.77±1.06 g/dl for urban areas.
2. It is found that hemoglobin level is significantly correlated with pregnancy status (pregnant and non-pregnant), underweight, maternal education, paternal education and household income.
3. Following the cut-off points suggested by the WHO Scientific Working Group (WHO, 1968), the prevalence of anemia among pregnant women is higher in urban (36.84%) than in rural (20.83%) areas, although it is not statistically significant (χ^2 = 1.35, df = 1, $p > 0.05$). In the case of non-pregnant women, the prevalence of anemia is more or less similar between urban women (40.89%) and rural women (40.33%). It is also found that the prevalence of anemia is higher among non-pregnant women (68.45%) than among pregnant women (38.71%), although it is not statistically significant (χ^2 = 2.70, df = 1, $p > 0.05$). Thus, despite the absence of statistical differences, the present findings are inconsistent with the general observation that the prevalence of anemia is higher in rural than in urban areas, or among the pregnant women than among the non-pregnant women. However, the

sample size for pregnant women in the present study is very small. Accordingly, the results may not be considered as being representative of the population.

4. The logistic regression analysis indicates that of many variables included in the model, only household income is significantly associated with the prevalence of anemia.

ANTENATAL CARE CHARACTERISTICS

1. It is found that that there is no significant difference between urban (86.81%) and rural (85.40%) areas with respect to awareness of ANC services ($\chi^2 = 0.06$, df = 1, $p > 0.05$).
2. The proportion of women attending ANC services is higher in urban (81.82%) than in rural (78.83%) areas, despite the absence of statistical difference ($\chi^2 = 0.77$, df = 1, $p > 0.05$).
3. As for the proportion of those who attended ANC services at least four times, it is found to be significantly lower in rural (32.12%) than in urban (42.18%) areas ($\chi^2 = 5.95$, df = 1, $p < 0.05$).
4. Of women who attended ANC services, about 71.53% in rural areas and 80.72% in urban areas made their first ANC visit during the 1st trimester of pregnancy. This rural-urban difference is statistically significant ($\chi^2 = 14.00$, df = 1, $p < 0.05$). Thus, the present findings suggest that the Loi women are not only aware of ANC services but also participated to a great extent.
5. As regards the nature of ANC services, it is found that about 59.72% of rural women and 72.44% of urban women, who attended ANC during pregnancy, have received iron and folic acid tablets during their visit to private and government ANC centres. This-rural-urban difference is also statistically significant ($\chi^2 = 7.97$, df = 1, $p < 0.01$). With respect to tetanus and toxoid injections, there are differences between rural and urban areas ($\chi^2 = 12.99$, df = 2, $p < 0.001$). It is found that the proportion of pregnant women, who received at least 2 doses of tetanus and toxoid injections, is significantly lower in rural (81.48%) than in urban (92.89%) areas ($\chi^2 = 12.94$, df = 1 $p < 0.001$). Therefore, it indicates that the nature of ANC services is poorer in rural than in urban areas as generally expected.

6. An attempt has also been made to understand the effects of socioeconomic factors on ANC attendance during pregnancy by using three models of logistic regression analysis. Of many covariates, it is found that mother's age, maternal and paternal education are important factors in influencing women to attend ANC services.

OBSTETRIC MORBIDITY

1. It is found that the prevalence rates of different obstetric problems are higher in rural than in urban areas, with the exception of excessive fatigue which is higher in urban than in rural areas. However, the rural-urban differences are not statistically significant except in the case of night-blindness and blurred vision, which is significantly higher in rural (6.69%) than in urban (2.21%) areas ($\chi^2 = 6.32$, df =1, $p > 0.05$).
2. With respect to the effects of biosocial factors, it is found that obstetric morbidity is independently associated with maternal age, household-income, maternal and paternal education. When only these variables are included in the logistic regression model, obstetric morbidity is significantly associated only with household-income. It also suggests that paternal education is more important than maternal education in influencing obstetric morbidity.

DELIVERY CHARACTERISTICS AND COMPLICATIONS

1. It is found that home delivery is more common in rural (72.84%) than in urban women (45.14%) and hospital or private clinic delivery is higher in urban women (54.86%) than in rural women (27.16%). These rural-urban differences with respect to place of delivery are highly significant ($\chi^2 = 39.51$, df = 1, $p < 0.0001$).
2. In rural areas, women are mostly helped by mid-wives (53.09%) as compared to the assistance received by them from the medical doctors and/or nurses. On the other hand, women in urban areas are generally assisted by medical doctors and/or nurses (71.60%) during delivery. These rural-urban differences are also statistically significant ($\chi^2 = 31.60$, df = 1, $p < 0.0001$).
3. With respect to delivery complications, there are no significant differences between rural and urban areas ($\chi^2 = 1.68$, df =1, $p< 0.05$).

4. Although there are no significant differences between rural and urban areas in respect of delivery complications, the present findings indicate that there are significantly rural-urban differences in respect of place of delivery and types of assistance received by women during delivery.
5. Of many biosocial factors considered in the logistic regression analysis, only maternal age and ANC visit are significantly associated with delivery complications.

SELF-REPORTED MORBIDITY

1. It is found that the rural-urban differences in respect of different types of self-reported morbidity are not statistically significant. The prevalence of overall morbidity (based on the number of women who experienced at least one type of health problem during the last one month before the survey) is higher in rural (34.62%) than in urban (27.80%) areas, although it is not significant. Pooling the data for both rural and urban areas, the prevalence of overall morbidity is 31.20%.
2. Logistic regression analysis indicates that self-reported morbidity is positively associated with nutritional status and anemia. It is also negatively associated with household income, maternal education and paternal education.

FAMILY PLANNING METHODS

1. It is found that the awareness of AIDS is very high in both rural (99.30%) and urban (99.46%) areas. Similarly, awareness of family planning methods is very high in both rural (94.52%) and urban (97.81%) areas. The adoption of family planning methods is higher in urban women (46.21%) than in rural women (42%), although it is not statistically significant ($\chi^2 = 0.98$, df =1, $p > 0.05$).
2. It is found that condoms and loop are the most common methods used in both rural and urban areas. It is further observed that private and Government primary health centers or hospitals are the main sources of contraceptive methods.
3. Of the different factors considered in the present study, adoption of family planning methods is found to be positively associated with maternal age, household income, maternal education and paternal education.

CHILD HEALTH AND NUTRITIONAL STATUS

In Chapter V, we have presented our findings on selected indicators of children's health and nutritional status in terms of infant and juvenile mortality, anthropometric indicators of nutritional status, immunization coverage and self-reported morbidity. Following are the major findings:

INFANT AND JUVENILE MORTALITY

The infant mortality rates (i.e. number of deaths before 1 year of life per 100 live births) of both rural and urban areas are 2.08 and 1.02%, respectively. The infant mortality rate is higher in rural area than in urban area, although it is not statistically significant ($\chi^2 = 2.93$, df = 1, $p > 0.05$). Pooling the data for rural and urban areas, the infant mortality is 1.57%. On the other hand, the juvenile mortality is very low in both rural (0.37%) and urban (0.26%) areas. Both infant and juvenile mortality rates are moderately low in the present population as compared to other populations in Northeast India. No statistical analysis was made to find out the factors affecting infant and mortality rates in the present population due to small sample size. As a matter of fact, only 25 cases of infant deaths (1.57%) were reported out of 1597 live-births for both rural and urban areas.

SELF-REPORTED MORBIDITY

1. Self-reported morbidity for children refers to the health problems of children as reported by the parents. It is observed that the rural-urban differences in the prevalence of health problems among girls are not clearly consistent. The prevalence of cold and respiratory disorders is higher in urban girls (5.29%) than in rural girls (3.98%), whereas the prevalence of intestinal disorders is higher in rural girls (5.97%) than in urban girls (4.33%). Nevertheless, the rural-urban difference in the overall prevalence of morbidity is not statistically significant, although it is slightly higher in rural girls (11.44%) than in urban girls (10.58%).
2. Unlike in the case of girls, the prevalence of the three different types of self-reported morbidity is higher in rural than in urban boys. Similarly, the overall prevalence of morbidity is higher in rural boys (13.57%) than in urban boys (7.29%), and the difference is statistically significant ($\chi^2 = 4.10$, df = 1, $p < 0.05$). The estimated odds ratio (OR) at 95% confidence interval (CI) indicates that the

rural boys were about 2 times higher in morbidity than their urban counterparts (OR = 2.00, CI = 1.01-3.93, $p < 0.05$).

3. Using logistic regression analysis, it is found that morbidity is positively associated with under-nutrition and negatively associated with household income. Thus, we may suggest that under-nutrition and household income are important factors in influencing morbidity patterns among the Loi Children of the present study.

ANTHROPOMETRIC INDICATORS OF NUTRITIONAL STATUS

In the present study, we have taken three important anthropometric indices, i.e., weight-for-age, height-for-age, and weight-for-height for assessing the nutritional status of the children aged 3-7 years, following the cut-off points given by WHO expert committees (1983, 1995). We have also made an attempt to correlate these indices with certain socioeconomic variables such as household income, family size, place of residence, maternal and paternal education, morbidity status, immunization status, etc.

1. The prevalence of underweight as indicated by weight-for-age is higher in rural (26.13%) than in urban (21.88%) areas. The odds ratio (OR) for rural-urban difference in the overall prevalence of underweight is found to be 1.26, that is, the risk of being underweight is about 1.26 times higher in rural than in urban boys. However, this rural-urban difference in the prevalence of underweight is not statistically significant. A similar case is observed among girls. The prevalence of underweight is higher in rural (28.86%) than in urban (23.56%) areas. The risk of being underweight in rural girls is about 1.31 times as compared to urban girls, despite the absence of statistical difference. Thus, there are no significant differences between rural and urban children in the prevalence of underweight, although it looks as if it is higher among the rural children.
2. With respect to the prevalence of stunting as indicated by height-for-age, it is found to be 35.68% in rural and 21.35% in urban boys. The risk of being stunting in rural boys is more than 2 times as compared to urban boys (OR = 2.09, 95% CI: 1.33-3.28, $p < 0.001$). The prevalence of tall stature is also higher in urban (11.46% than in rural (8.54%), although it is not significant. As for girls, there are no significant differences between rural and urban areas, although the prevalence of stunting is higher in rural (37.81%) than in urban (35.58%) areas.

3. The prevalence of wasting as indicated by weight-for-height is also higher in rural (6.53%) than in urban (3.13%) boys, although it is not statistically significant. The same is true among girls in which the prevalence is higher in rural (7.96%) than in urban (4.33%) areas, despite the absence of statistical difference. It is also found that obesity also exists in both boys and girls, and the prevalence is higher in urban than in rural areas, although it is not significant.
4. In order to understand the effects of biosocial factors on the nutritional status of children, an attempt has been made to group them into two major groups, namely, normal and undernourished. Undernourished children refer to those children who suffered from at least one of the three nutritional problems, namely, underweight, stunting and wasting as indicated by anthropometric indicators. The overall prevalence of under-nutrition, as defined above, is found to be much higher in girls (44.74) than in boys (36.32%), and the difference is statistically significant (χ^2 = 5.88, df = 1, $p < 0.01$). Using logistic regression analysis, it is found that under-nutrition is positively associated with sex and morbidity, and negatively associated with family size and household income. Thus, it may suggest that under nutrition among the Loi children is highly associated with sex, morbidity status, family size and household income.

IMMUNIZATION COVERAGE

In the present study, we have considered four important vaccinations, namely, BCG, measles, polio and diphtheria. It is found that the rural-urban differences are inconsistent and not statistically significant. It is observed that the overall immunization rate (i.e., the number of those who received at least two vaccinations) among girls is higher in rural (60.20%) than in urban (57.21%) areas, but it is not statistically significant ($\chi^2 = 0.38$, df = 1, $p > 0.05$). On the other hand, the immunization rate in boys is higher in urban (69.27%) than in rural (65.83%) areas. But the differences are not statistically significant ($\chi^2 = 0.53$, df = 1, $p > 0.05$).

As for sex differences, it is found that the immunization rate is higher in boys than in girls for both rural (girls = 60.20%, boys = 65.83%) and urban (girls = 57.21%, boys = 69.27%) areas. The differences are found to be statistically significant in urban areas (χ^2 = 6.23, df = 1, $p < 0.01$), but insignificant in rural areas ($\chi^2 = 1.36$, df = 1, $p > 0.05$). Although these findings indicate to certain the existence of gender bias with respect to

immunization coverage, the logistic regression analysis indicates that the sex differences disappeared after adjusting for other covariates. It is found that immunization is negatively associated with morbidity status and family size, and positively associated with maternal education and paternal education. Thus, it suggests that immunization coverage among the Loi children is highly associated with morbidity status, family size maternal and paternal education.

CONCLUDING REMARKS

Rural-urban differences

Rural populations are generally poorer and have lower levels of education than their urban counterparts. There are fewer hospitals and physicians in rural communities; the time taken to travel to health care providers is often greater and public transportation less available. These problems may be magnified in rural areas far distant from any urban center even in the developed countries like the USA (Ormond *et al.*, 2000). It may be hypothetically assumed that the situation is more aggravated in developing countries like India (IIPS, 2000). However, the present study indicates that rural-urban differences with respect to maternal and child health indicators are by and large not significant, except in few cases. The main reason is that the differences in socio-economic conditions like education and income are controlled while analyzing the rural-urban differences with respect to different maternal and child health indicators.

However, the absence of statistical differences with respect to demographic indicators like fertility, reproductive wastage and infant mortality is not mainly due to differences in socio-economic condition between rural and urban areas. Instead, other factors like family planning programmes and health services may play important role. For example, age at marriage is significantly lower in rural than in urban areas. The present study indicates that awareness of family planning methods is very high in both rural and urban areas. There is also no significant difference between rural and urban areas with respect to adoption of family planning methods. Similarly, it is found that that there is no significant difference between urban and rural areas with respect to awareness and attendance of ANC services. Thus, it is likely that the absence of rural-urban differences with respect to in fertility and mortality (infant and reproductive wastage) is mainly due to

the successful family planning programs and health care services in Manipur as compared with other states in Northeast India (IPPS, 2000).

The success of family planning programs and public health services can also be assessed in terms of obstetric morbidity, delivery complications, anemia and self-reported morbidity, and immunization coverage. The present study failed to get any significant differences between rural and urban areas with respect to these health indicators. Thus, although socio-economic inequality does exists between rural and urban areas, it is likely that successful implementation of planning programs and public health services would bring about a balance between rural and urban areas in respect of certain health indicators among the Loi women and children of the present study. Earlier studies have also suggested that greater women's autonomy, involvement of social organizations, political will for implementing health care services, increased standard of living are operating synergistically to lower fertility and mortality in Manipur (Kumar, 1995).

With respect to nutritional status, overweight among the Loi community is likely to be a major nutritional problem especially in the next decade or so. There are also significant differences between rural and urban areas with respect to the prevalence of overweight among the Loi women. On the other hand, under-nutrition is the major health problem among children. The overall prevalence of under-nutrition among children is significantly higher in rural than in urban areas. The prevalence of overweight is also higher in urban than in rural areas, although it is not statistically significant. The rural-urban difference in BMI or nutritional status is mainly because of the differences in socio-economic factors like education and economic conditions. In addition, individuals in urban areas are likely to be more sedentary in lifestyles with less physical activity, and thereby they are likely to be overweight.

Anthropological Implications

The present study has clearly revealed that maternal and child health status in the higher socio-economic groups, whether in terms of educational or income level, is by and large better than that in the lower ones. On the basis of these findings, the moot anthropological question is that whether being in poor socio-economic condition is also indicative of being victims of natural selection? Natural selection acts primarily at the individual level. The simple definition of natural selection given by Darwin (1859) is the "preservation of favorable individual differences and variations, and the destruction of those which are

injurious." He further clarified that "under the term of "variations," it must never be forgotten that mere individual differences are included." Thus, natural selection operates primarily at the individual level through differential survival and reproduction. The aggregate or average differential survival and reproduction of a given number of individuals may be considered its action at a group or population level.

Like the present study, there is considerable evidence that the health and nutritional status of the poor is worse than is the rich. Mortality rates due to malnutrition, infections and other causes of deaths are much higher in the lower socio-economic classes (Khongsdier, 2006). The significance of these inequalities also influenced the writings of Malthus (1803) and Darwin (1871, 1859). According to Malthus (1803), the "constant tendency in all animated life to increase" would prevent any permanent amelioration of poverty in the lower classes. In Central and South Asia, the positive checks including epidemics and consequences of "indigence and bad nourishment" would fall heavily on those in the lowest socio-economic strata "before any considerable degree of want had reached the middle classes of the society" (Malthus, 1803). Acknowledging this important observation of Malthus, Darwin (1871) wrote, "As all animals tend to multiply beyond their means of subsistence, so it must have been with the progenitors of man; and this would inevitably lead to a struggle for existence and to natural selection." Although Darwin did not say that natural selection is stronger among the poor, he also observed the "greater death-rate of infants in the poorest classes ... as well as the greater mortality, from various diseases, of the inhabitants of crowded and miserable houses, at all ages" (Darwin, 1871). It was Franz Boas (Boas, 1938) who argued that natural selection in humans operates primarily through social stratification. In addition, malnutrition, associated with poor environmental conditions in the lower socio-economic strata, is suggested to be a strong force of natural selection especially among children and reproductively-active women (Segraves, 1977). Thus, the view that socio-economic inequality mediates the process of natural selection in human populations seems to have originated with Darwin himself (Strickland & Tuffrey, 1997).

Natural selection is a blind natural force that preserves the beneficial variations and eliminates the injurious ones. The process of preserving the beneficial variations is also known as the *survival of the fittest* in the *struggle for existence*. According to Malthusian and Darwinian points of view, the struggle for existence, or competition for survival, is

due to the increase in population beyond the means of subsistence. The short supply of resources, therefore, increases competition in different forms including social stratification in which "members of the privileged class may own even up to or over 10,000% of what a poor person owns" (Cohen, 1998). The high prevalence of malnutrition and infections is a clear evidence of poor access to adequate nutrition and health amenities among the lower socio-economic classes. From this point of view, one may argue that social stratification mediates natural selection in human populations in the form of malnutrition, infections and ill health, which ultimately lead to higher morbidity and mortality in the lower strata of social stratification. However, this argument is based simply on differential survival or *survival of the fittest* due to limited resources mediated by social stratification. There is no evidence that the operation of natural selection in the lower socio-economic strata of the society is genetic in nature (Khongsdier, 2006). Therefore, equality of economic opportunity in a society, for example, enables a man to choose any occupation, which is most suited for him by his abilities and willingness to strive for his survival and well-being.

POLICY IMPLICATIONS

The present study indicates that almost health indicators are better in Loi population of Manipur as compared to those reported for populations in Northeast India. Accordingly, if this trend is similar to all populations in the state, Manipur should be considered a model state in Northeast India as far as maternal and child health indicators are concerned. For example, the infant mortality in the present population is slightly lower than that reported for Kerala (IIPS, 2000). It is also observed that awareness of AIDS and family planning programs is very high in the present population, although the rate of adoption of modern contraceptives needs to be intensified. Similarly, immunization coverage is better in the present population of Manipur as compared to other states in Northeast India.

The major concern, according to the findings of the present study, is the tendency to high prevalence of overweight especially in urban areas needs to be checked with different preventive measures including increased physical activity and dietary measures. Recent reviews has revealed that although under-nutrition remains a major health problem in many developing countries, over-nutrition is also emerging with the improvement in socio-economic condition and/or increasing urbanization (Popkin, 2002, Khongsdier, 2005c). Consequently, the double burden of under- and over-nutrition exerts considerable

impact on the economy and health system in many developing countries. In general, many countries in Asia are in this situation due to "changing dietary pattern towards energy-dense and high fat diets, together with a more sedentary lifestyle arising from increasing urbanization" (Florentino, 2002). The increasing urbanization, changes in standards of living, dietary patterns and occupational work patterns are the key factors to risks of the epidemic of obesity and associated morbidity and mortality. Therefore, the spread of overweight and obesity in the Loi population needs to be monitored and prevented, but it should not be done at the expense of the efforts to alleviate under-nutrition. It is observed in the present population that the prevalence of under-nutrition in children is still high especially in rural areas. The present study suggests that child welfare programs like integrated child development schemes in the state needs to be implemented with greater intensity in the near future.

Another implication for policy making is that the prevalence of under-nutrition is much higher in girls than in boys especially in rural areas. Also, the rate of immunization coverage is higher in boys than in girls. It is often argued that discrimination against females is very high in South Asian populations because of the patrilineal system of societies. In Northeast India, recent analysis on the nutritional status of the adolescents in both patrilineal and matrilineal societies did not confirm such an observation (Khongsdier *et al.*, 2005). It is observed that the nutritional status is better in females than in males in both matrilineal and patrilineal societies. However, the present findings among the Loi children seem to be more corroborated with those observed in other parts of India and many other populations of Southeast Asia where the nutritional status of boys are far better than that of girls. Earlier studies have suggested that women in Manipur enjoy higher status (Kumar, 1995). It is also suggested that bride price is still practiced in the Loi society, thereby enhancing the status of women especially those in the lower socio-economic group (Ghosh and Ghosh, 1997). Accordingly, it is expected that the nutritional status and immunization coverage should not be different between the sexes of children. On the contrary, the present study suggests that more attention should be given to improve the immunization and nutritional status of children, especially that of female children below 7 years of age. As for immunization, it is likely to be associated with socio-economic conditions like parental education. Therefore, educational policy especially relating to increased female education should be more intensified.

LIMITATIONS

The present study on maternal and child health has many limitations. The covariates taken in the study are also limited. But we hope that the findings of the study will stimulate different research questions that enhance our knowledge of the health and well-being of mothers and children in Northeast India. The present study is limited to one population of Imphal valley. It indicates that almost health indicators are better as compared to those reported for populations in Northeast India. However, it is not clear whether this trend is similar to all populations in the state, especially among tribal populations in hill areas of the state. More studies are needed to carry out in other populations especially among tribal populations to have a clear idea of the health and nutritional status in the state of Manipur.

The present study is not concerned with sex discrimination, which is generally reported for Indian populations. It simply indicates that the nutritional and immunization status is better in boys than in girls. More studies are needed to carry out to understand whether there exists sex discrimination in different populations of Manipur. Moreover, the study is concerned mainly with the reproductive health of women, without paying much attention to the reproductive health issues concerning men, or both men and women. Future studies should also focus on issues relating to male reproductive health, especially the role of men in improving the reproductive health of women. In addition, future studies should also focus more on breast feeding and infant feeding practices which are not covered in the present study.

REFERENCES:

Abdullah Khan, H.T. and Raeside, 1994. Urban and rural fertility in Bangladesh: a causal approach. *Soc. Bio.*, **41**: 240-251.

Adamchak, D. J. and Mbizvo, M.T. 1994. The impact of husband and wife's education and occupation on family size in Zimbabwe. *J. Biosoc. Sci.*, **26**: 553-558.

Addai, I. 1999. Ethnicity and contraceptive use in Sub- Saharan Africa: the case of Ghana. *J. Biosoc. Sci.*, **31**: 105-120.

Aggarwal, H., Vaid, S. and Vaid, N. 2005. Comparison of the level of awareness of family planning measures in the urban and urban slum women. *Anthrop.*, **7**: 35-40.

Ahmed, A. 1991. *Women and Fertility in Bangladesh.* New Delhi: Sage Publication.

Ahmed, S. 1985. Rural-urban differentials in marital fertility in four Muslim populations. *J. Biosoc. Sci.*, **17**:157-66.

Akoto, E. and Tambashe, T.O. 2006. Socioeconomic Inequalities in Infant and Child Mortality among Urban and Rural areas in Sub- Saharan Africa.

Allen, L. H. 2000. Anemia and iron deficiency: effects on pregnancy outcome. *Am. J. Clin. Nutr.*, **71**: 1280-1284.

Amengon, M. G., Owusu, W.B. and B.D. 2005. Determinants of anaemia in pregnancy in Sekyere West District, Ghana, *Ghana Med. J.*, **39**: 102-107

Amin, R. 1990. Infant and child mortality in Bangladesh. *J. Biosoc. Sci.*, **20**: 29-65.

Andoh, S.N., Umezaki, M., Nakamura, K., Kizuli, M. and Takano, T. 2007. Association of household demographic variables with child mortality in Cote D'voire. *J. Biosoc. Sci.*, **39**: 257-265.

Arora, C. 1990. *Social structure and fertility.* New Delhi: National Book Organisation.

Arnold, F., Choe, M.K. and Roy, T.K. 1998. Son preference, the family building process and child mortality in India. *Popn. Stud.*, **52**:301-315.

Assami, M., Hereberg, S., Assami, S., Galan, P., Assami, A. and Potier de Courey, G. 1987. Assessment of the nutritional status of Algerian women in the reproductive age living in an urban, rural and semi-rural. *Ann. Nutr. Metab.*, **39**:237-44

Bairagi, R. and Chowdhury, M.K. 1994. Socioeconomic and anthropometric status, and mortality of young children in rural Bangladesh. *Int. J. Epi.*, **23:** 1179-1184.

Bang, R.A., Bang, A.T., Baitule, M., Choudhurry, Y., Sammukaddam, Y.S. and Tale, O. 1989. High prevalence of gynecological disease in rural Indian women. *The Lancet.*, **1**: 5-88.

Bandyopadhyay, M. and Stewart Mac, P. 1998. *Women and Health: Tradition and Culture in Rural India.* Singapore and Sydney: Ashgate, Aldershot Brookfield USA.

Barakani, A., Ahmed, N. and Abdul-Rub, A. 1999. Infant and child mortality in Yemen. Centre for Population Studies and Research at the Central organization for Statistics 10 Vol. IX.

Barrette, H. and Browne, A. 1996. Health, hygiene and maternal education: evidence from Gambia. *Soc. Sci. and Med.*, **43**: 1579-90.

Basu, A.M. 2005. Ultramodern contraception, social class and family planning in India. *Asian. Popn. Stud.*, **1**: 1744-1749.

Basu, S. and Mitra, K. 2001. Health development of tribal communities of India: need for action research. *Ind. J. Soc. Dev.*, **1:** 134-156.

Bergsjo, P. 2001. "What is the evidence for the role of antenatal care strategies in the reduction of maternal and morbidity?" In: *Safe Motherhood Strategies: A Review*

of the Evidence, edited by De Brouwere, V. L. and W.V. Studies in Health Services Organisation and Policy No. 17. Antwerp: ITG Press.

Berhman, J.R. and Wolfe, B.L. 1984. More evidence on nutrition demand: income seems overrated and women's schooling underemphasized. *J. Dev. Eco.*, **14**: 105-128.

Bentley, B.E. and Griffiths, P.L. 2003. The burden of anemia among women in India. *Eur. J. Clin. Nutr.*, **57**: 52-60

Bhatia, J.C. and Cleland, J. 1996. Obstetric morbidity in South India: results from a community survey. *Soc. Sci. Med.*, **43**: 1507-1516.

Bhatia, J.C. and Cleland, J. 1995. Determinants of maternal care in a region of South India. *Health Tran. Rev.*, **5**:127-142.

Bharati, P. 1983. A study on the relationship between socio-economic condition, nutrition and health in Mahisya population sample. Unpublished Ph. D. Thesis, Calcutta University.

Bharati, P. and Dastidar, M.G. 1990. Maternal Education, fertility and mortality in the Bengali population sample. *J. Ind.Anthrop.Soc.*, **25**: 90-93

Bharati, P., Itagi, S. and Megeri, S.N. 2006. Anthropometric measurements of school children of Raichur, (Karnataka). *J. Hum.Ecol.*, **18**:177-179.

Bhasin, V. and Bhasin, M. K. 1993. Ecology, population dynamics among Transhumants of Himalayas: a case study of Gaddis of Himachal Pradesh. *J. Hum. Ecol.*, **4**: 171-219.

Bhasin, V. and Bhasin, M. K. 2000. A cross- cultural fertility differential in Sikkim. *J. Hum. Ecol.*, **11 :** 429-444.

Bhende, A. A. and Kanitkar, T. 2003. *Principles of Population Studies*. Mumbai: Himalaya Publishing House.

Bhuyan, K.C. 1998. Education, fertility and family planning practices in rural area of Bangladesh. *The J. Fam. Wel.*, **33**: 3-15.

Biecgo, T.G. and Boerma, J.T. 1993. Maternal education and child survival: a comparative study of survey data from 17 countries. *Soc. Sci. Med.*, **36**:1207-27

Birch, L.C. 1957. The meaning of competition. *Am. Nat.*, **91**: 5-18.

Bloom, S., Lippeveld, T. and Wypij, D. 1999. Does antenatal care makes a difference to safe delivery? A study in urban Utter Pradesh India. *Health Pol. and Plann.*, **14**:38-48.

Boerma, J.T. 1991. Childhood morbidity and treatment patterns. Demographic and Health Surveys, Comparative Studies No.4. Institute for Resources Development/ Macro International Inc, Columbia, Maryland, USA.

Bongaarts, J. 1978. A framework for the analysis of the proximate determinants of fertility. *Popn. Dev. Rev.*, **4** : 105-132.

Bor, W., Najman, J. M., Anderson, M. J., Morrison, J. and Willims, G.M. 1993. Socioeconomic disadvantage and child morbidity: an Australia longitudinal study. *Soc. Sci. Med.*, **36**: 1053-1061.

Breyman C.H. 2002. Iron supplementation during pregnancy. *Fetal and Mat. Med. Rev.*, **13**:1-29.

Brown, K.H. 1984. Measurement of dietary intake. *Popn. Dev. Rev.* (Suppl.), **10**: 69-91

Bulliyya, G. 2004. Micronutrient malnutrition with reference to Iron deficiency anaemia status in Orissa. *Man in Ind.*, **84**:33-50.

Caldwell, J.C. and Mc Donald, P. 1982. Influence of maternal education on infant and child mortality: Levels and Causes. *Proceedings of IUSSP Conference in Manila* **2**:79-95

Caldwell, J.C., Khuda, B.E., Caldwell, B., Pieres, I. and Caldwell, P. 1999. The Bangladesh fertility decline: an interpretation. *Popn. Dev. Rev.*, **25**: 67- 84.

Cao, X. 2007. Does policy relaxation increase contraceptive flexibility: short- acting contraceptive use in China (Draft Version)? *http//paa 2007. Princeton.edu/download.aspx? submissionId* = 70470.

Carroli, G., Rooney, C. and Villar, J. 2001. How effective is antenatal care in preventing maternal mortality and serious morbidity? An overview of the evidence. *Pediatrc. Peri. Epi.*, **15**: 1-42.

Cassell, J.A., Leach, M., Fairhead, J.R., Small, M. and Mercer, C.H. 2006. *The Social Shaping of Childhood Vaccination Practice in Rural and Urban Gambia.* School of Tropical Mediciene, London: Oxford University Press.

Census of India, 2001. *Provisional Population Totals*, series 1, paper 1. New Delhi: Census of India.

Chandiok, N., Dhikor, S.B., Kambo, I. and Saxana, C.N. 2006. Determinants of antenatal care utilization in rural areas of India: a cross-sectional study from 28 districts (An ICMR task force study). *J. Obstet. Gynea. Ind.*, **56**: 47-52.

Chandrashekar, S., Phaneendran, R.S. and Nair, N.S. 1998. Socio- demographic determinants of antenatal care. *Trop. Doc.*, **28:** 206-209.

Cham, M. Sundby, J. and Vangen, S. 2005. Maternal mortality in the rural Gambia, a qualitative study on access to emergency obstetric care. *Reprod. Health.*, **2**: 1-8.

Chattopadhyay, A. and Roy, T.K. 2005. Are urban poor doing better than their rural counterpart in India? A study of fertility, family planning and health. *Demo. Ind.*, **24**:299-312.

Chattopadhyay, A. and Goswami, B. 2007. Status of women in two Bengals: evidence from large scale surveys. *J. Biosoc. Sci.*, **39**: 267-286.

Chisholm, J.S. and Burbank, V.K. 2001. Evolution and inequality. *Int. J. Epi.*, **30**: 206-211.

Chopra, K. and Makol, N. 2004. Awareness, perception and reproductive health related practices in males and females in a district of Rajasthan. *Ind.J. Phys. Anthrop. & Hum. Genet.*, **23**:21-32.

Choudhury, A.K.M. 1982. "The concept of intermediate level variables in mortality studies". In: *Infant and Child Mortality in Bangladesh,* edited by Edmonston, B. and Bairagi, R. Dacca: University of Dacca.29-37

Choudhury, R.P. 1988. Child mortality determinants among two tribes of Rajmahal hills (Bihar). *Ind. J. Phy. Anthrop. Hum. Genet.*, **14:**71-83.

Cleland, J., Phillips, J.F., Amin, S. and Kamal, G. M.1994. *The determinants of Reproductive Change in Bangladesh: Success in Challenging Environment.* Washington., DC.: The World Bank.

Cleland, J. and Van Ginneken, K. J. 1988. Maternal education and child survival in developing countries: The search for pathways of influence. *Soc. Sci. and Med.*, **27**: 1357-68.

Cochrane, S.H. 1983. "Effect of education and urbanization on fertility". In: *Determinants of reproductive change in Bangladesh: Success in Challenging Environment.* Washington, DC: The World Bank.

Cohen, M.N. 1998. "The Emergence of Health and Social Inequalities in the Archeological record". In: *Human Biology and Social Inequality*, edited by Strickland, S.S. and Shetty, P.S. Cambridge: Cambridge University Press.

Curtis, S.L. and Steele, K.1996. Variations in familial neonatal mortality risks in four countries. *J., Biosoc., Sci.*, **28**: 141-159.

Dabral, S. and Malik, S.L. 2005. Demographic Study of Gujjars of Delhi: maternal and child health care practices. *J.Hum. Ecol.*, **17**: 1-12.

Darwin, C. 1859. *The Origin of Species by Means of Natural Selection.* Oxford: Oxford University Press.

Darwin, C. 1871. *The Descent of Man and Selection in Relation to Sex.* London: John Murray.

Dasgupta, P. 2000. Population and resources: an exploration of reproductive and environmental externalities. *Popn. Dev. Rev.*, **26**: 643-689.

Das, R. K. 1985. *Manipur Tribal Scene Studies in Society and Change.* New Delhi: Mittal Publications.

Dastidar, M.G. and Gupta, R. 2000. "A Study on Family Planning, Fertility and Ideal Family size among the Hindu and Muslim slum dwellers of Calcutta city". In: *Contemporary Research in Anthropology*, edited by Khongsdier, R. New Delhi: Commonwealth Publishers.

Das, N.P., Mishra, V.K. and Saha, P.K., 2001. *Does community access affect the use of health and family welfare services in rural India*? Mimbai: IIPS.

Das, N.P. and Dey, D. 1998. Female age at marriage in India: trends and determinants. *Demo. Ind. (Spl issue)*,: 91-115.

Das, R. and Goswami, M. 2004. Fertility performance of tea working population of Dibrugarh District, Assam. *J. Hum. Ecol.*, **16**: 119-123

Das, N.P. and Shah, U. 2001. *Understanding Women's Reproductive Health Needs in Urban Slums in India: A Rapid Assessment.* Paper contributed for XXIV, IUSSP General Population Conference, Salva dor, Brazil, 18-24 August.

DeBroe, S., Hinde, A., Matthews, H. and Padmadas, S.S. 2005. Diversity in family planning use among ethnic groups in Gautemala. *J. Biosoc. Sci.*, **37**.301-317

DeSilva, W.I. 1991. Consistency between reproductive preferences and behaviour: the Sri Lanka experience. *Stud. Fam. Plann.*, **22** (3): 188-197.

Devi, L.B. 2002. *Lois of Manipur.* New Delhi: Mittal Publication.

Dobzhansky, T. 1962. *Mankind Evolving: The Evolution of the Human Species.* New Haven and London: Yale University Press.

Do, M. and Koenigm, M.A. 2007. Effect of family planning services on modern contraceptive method continuation in Vietnam. *J. Biosoc. Sci.*, **39** : 201-220.

Dodoo Ni-Amoo, F. 2001. "Fertility preferences and contraceptive use: a profitable nexus for understanding the prospects for fertility decline in Africa". Workshop on *Prospects for Fertility Decline in High Fertility Countries.* Population Division: United Nations Secretariat, New York. 9-11 July.

Eagle, P.L. and Menon, P. 1996. *Urbanization and care giving: evidence from south and eastern Africa.* San Luis, California: Department of Psychology and Development California Polytechnic, Stat. University. pp 4-24.

Eloundou- Enyegue, P.M., Stokes, C.S. and Cornwell, G. 2000. Are these crises- led fertility declines? Evidence from central Cameroon. *Popn. Research. Policy Rev.*, **19**: 47-72.

Esseghairi, K., Hinde P.R.A., Mc Donald, J.W. and Meddeb, S. 1991. IUD and pill use dynamics in Tunisia and Morocco. *In Demographic and Health Surveys World Conference: Proceedings*, **3**: 119-34.

Eveleth, P.B. and Tanner, J.M. 1990. *World Wide Variation in Human Growth*, 2nd edition. Cambridge: Cambridge University Press.

Elvira, B.C. and Elba, M.S.1991. Iron status in non- pregnant women of child- bearing age living at greater Buenos Aires. *Eur. J. Clin. Nutr.*, **45**: 218-220

Ewbank, D., Henin, R. and Kekovole, J. 1986. "An Integration of Demographic and Epidemiologic Research on Mortality in Kenya". In: *Determinants of Mortality Change and Differentials in Developng countries*. WHO Publication Studies No. 94. Geneva: WHO.

Fagnani, J. 1991. "Fertility in France: The influence of urbanization". In: *the Geographical Approach to fertility Kieler Geographischo Schriften 78*: edited by Bahr, J. and Gans, P. Geographisches Institut der: Universitat Kiel.

Feng, W., Ren, P., Shaokang, Z. and Anan, S. 2005. Reproductive health status, knowledge, and access to health care among female migrants in Shanghai, China. *J. Biosoc. Sci.*, **37:** 603- 622.

Fernandez, A., Mondkar, J. and Mathai, S. 2003. Urban slum-specific issues in neonatal survival. *Ind. Pediatrc.*, **40:** 1161-1166.

Ferro- Luzzi, A., Sette, S., Franklin, M. and James, W.P.T. 1992. A simplified approach of assessing adult chronic energy deficiency. *Eur. J. Clin. Nutr.*, **46**:173-186.

Findley S.E. 2005. A suggested framework for analysis of urban- rural fertility differentials with an illustration of the Tanzanian case. *Popn and Env.*, **3**: 3-4.

Florentino, R.F. 2002. The burden of obesity in Asia: challenges in assessment, prevention and management. *Asia Pac. J. Clin. Nutr. (Suppl.).*, **11**: S676-S680.

Fortney, J.A., 1987. The importance of family planning in reducing maternal mortality. *Stud. Fam. Plann.*, **4**: 95-117.

Fotso, J.C. and Kuate- Defo, B. 2006. Household and community socio-economic influences on early childhood malnutrition in Africa. *J. Biosoc. Sci.*, **38**: 289-313.

Freeny, G. and Feng, W. 1993. Parity progression and birth intervals in China: the influence of policy in hastening fertility decline. *Popn. Dev. Rev.*, 19: 61-101.

Frisancho, A.R. 1990. *Anthropometric Standard of the Assessment of Growth and Nutritional Status.* Michigan: University of Michigan Press.

Galler, J.R., Ramsay, F.C., Morley, D.S., Archer, E. and Salt, P. 1990. The long – term effects of early kwashiorkor compared with marasmus. IV. Performance on the national high school entrance examination. *Pediatrc. Res.*, **28**: 235-239.

Galloway, P.R., Lee, R.D. and Hammel, E.A. 1998. Urban vs rural: fertility decline in the cities and rural districts of Prussia, 1875 to 1910. *Eur. J. Popn.*, **14**: 209-264.

Gallus, S., Colombo, P., Scarpino, V., Zuccaro, P., Negri, E., Apolone, G. and La Vecchia, C. 2006. Overweight and obesity in Italian adults 2004, and an overview of trends since 1983. *Eur. J. Clin. Nutr.*, **60** : 1174-1179.

Garcia, M and Kennedy, E. 1994. Assessing linkages between body mass index and morbidity in adults: evidence from four developing countries. *Eur. J. Clin. Nutr.* (Suppl.3), **48:** S:90-S97.

Gaur, R., Kaur G. and Saini K. 2002. Nutritional profile and growth of Rajput children in Himachal Pradesh. *Man in Ind.*, **82**: 31-41

Gautam, A.C. and Seth, P.K. 2001. Appraisal of the knowledge, attitude and practice (KAP) of family control devices among rural Rajputs and Schedule Caste of Hatwas area of Bilaspur district, Himachal Pradesh. *Anthrop.*, **4:** 289-292.

Gertler, P.J. and Molyneaux, J. W. 1994. How economic development and family planning programes combined to reduce Indonesian fertility. *Demo.*, **31**:33-63.

Ghosh, G.K. and Ghosh, S. 1997. *Women of Manipur*. New Delhi: APH Publishing Corporation.

Ghosh, A., Roy, K. and Mohen, K. 1983. A study of the effects of some biocultural factors on human fertility. *J. Soc. Res.*, **26**: 113-136.

Ghosh, S. and Shah, D. 2004. Indian pediatrics- environmental health project, Special article. Series. *Ind. J Pediatrc.*, 41:682-696.

Girma, W. and Genebo, T. 2002. *Determinants of nutritional status of women and children in Ethopia*. Calverton, Maryland, USA: ORC Macro.

Giashuddin, M.S., Kabir, M. and Hasan, M. 2005. Economic disparity and child nutrition in Bangladesh. *Ind. J. Pediatrc.*, **75**: 481-487.

Gogoi, A.P. 2002. "Effects of Some Socio- Cultural Factors on Fertility and Mortality among the Mundas of Assam- A Preliminary Appraisal". In: *Ethnic Groups, Cultural Continuities and Social Change in North East India*, edited by Barua, I., Sengupta, S. and Das, D.D. New Delhi: Mittal Publications.

Gopalan, C. 1998. Obesity in the urban "middle class". *NFI Bull.*, **19**(1).

Govindasamy, P. and Ramesh, B.M. 1997. Maternal education and the utilization of maternal and child health services in India. Mumbai: IIPS.

Griffiths, P. and Stephenson, R. 2001. Understanding users' perspectives of barriers to maternal health care use in Maharastra, India. *J. Biosoc. Sci.*, **33**:339-359.

Gulati, S.C. 1988. *Fertility in India: An Econometric Analysis of a Metropolis*. New Delhi: Sage Pulbications.

Gulati, S.C., Tyagi, R.P. and Sharma, S. 2003. "Maternal and Child health Care". In: *Reproductive health in Delhi Slum,* edited by Bhattacharya, B.B. Delhi: B.R. Publishing Corporation.

Guo-qing, MI., Chen, X. and Geo, E. 2004. Analysis of antenatal care and its related factors among married Chinese women. *Repduct. and Contracep.*, **15**:55-60.

Gwatikin, D., Rustein, S., Johnson, K., Pande, R. and Wagstaff, A. 2000. *Socio- economic differences in health, nutrition and population.* Washington (DC): World Bank.

Gwatikin, D. and Deveshwar- Bhal, G. 2001. Immunization coverage inequalities: an overview socio-economic and gender differentials in developing countries. The World Bank Group.
http:// poverty.worldbank.org.library/view.php?id = 8970.

Hardee, K., Agarwal, K., Luke, N., Wilson, E., Pendzich, M., Farell, M. and Cross, H. 1999. Reproductive health policies and programs in eight countries: progress since Cairo. *Inter. Fam. Plann. Persp.*, **25**:2-9.

Harrison, G. A. 1998. "Physiological adaptation". In: *Human adaptation*, edited by Harrison, G.A. and Morphy, H. Oxford: Oxford University Press.

Haub, C. and Huong, P.T.T. 2003. *Overview of Population and Development in Vietnam.* Washington, DC: Population Reference Bureau.

Heaton, T.B., Forste, R., Hoffmann, J.P. and Flake, D. 2005. Cross- national variation in family influences on child health. *Soc. Sci. Med.*, **60**: 98-108.

Hotchkiss, D.R., and Mock, N.B. and Seiber, E.F. 2002. The effect of the health care supply environment on children's nutritional status in rural Nepal. *J. Biosoc. Sci.*, **34**:173-192.

Howlader, A.A. and Bhuiyan, M.U. 1999. Mother's health seeking behaviour and infant and child mortality in Bangladesh. *Asia- Pac. Popn. J.*, **14**:59-75

Hudson, T.C.1989. *The Meitheis*. Delhi: Low Price publications.

Hutter, I., Rajaretnam, T., Rajeswari, N.V. and Hallad, J.S. 2006. *Perspective on reproductive health in Dharwad, Karnataka.* Sattellite research project. "http://www.idpad.org/pdf/3.1.pdf"

International Institute of Population Sciences. 2007. *National Family Health Survey* (NFHS-3), 2005-06. Mumbai: IIPS.

International Institute of Population Sciences 2000. *National Family Health Survey* (NFHS-2), 1998-99. Mumbai: IIPS.

International Institute of Population Sciences, IIPS. 1995. *National Family Health Survey (Maternal and Child Health and Family Planning).* 1992-93, Mumbai: IIPS.

Irudaya Rajan, S. and Rao, S. 1991. Can we explain demography through culture? *Man in Ind.*, **71**: 383-399.

Islam, M.Z., Allardt, C.L., Bhuyan, M.A.H. and Salamatullah, Q. 2001. Iron status of premenopausal women in two regions of Bangladesh: prevalence of deficiency in high and low socio-economic groups. *Eur. J. Clin. Nutr.*, **55**: 598-604.

Iyer, S. 2002. Demographic and Religion in India. New Delhi: Oxford University Press.

Jain, R. and Parasuraman, S. 2004. "Maternal Morbidity and Utilization of Antenatal Care Services". In: *Population, Health and Devlopmant in India. Changing Perspective*, edited by Roy, T.K., Guruswamy, M. and Arokiaswamy, P. New Delhi: Rawat Publication.

Jain, S., Chopra, H., Gerg, S.K., Bhatnagar, M. and Singh, N., 2006. Anaemia in children: early iron supplementation. *Ind. J. Pediatrc.*, **67**: 19-21.

Jamil, K., Bhuiya, A., Streatfield, K. and Chakrabarty, N. 1999. The immunization programme in Bangladesh: impressive gains in coverage, but gaps remain. *Health Pol. and Plann.*, **14**:49-58.

James, W.P.T., Ferro Luzzi, A. and Waterlow, J.C. 1988. Definition of chronic energy deficiency in adults. *Eur.J.Clin. Nutr.*, **42:** 969-981.

Jaswal, I.J.S. and Jaswal, S. 2005. Physical growth and nutritional status of rural children of Western Sub- Himalayan region. *Ind.J.Phys. Anthrop. Hum. Genet.*, **24**: 123-134.

Jejeebhoy, S.J. 1997. Maternal mortality and morbidity in India: priorities for social science research. *J. Fam. Wel.*, **43**: 31-52.

Jelliffe, D.B. 1966. Assessment of the nutritional status of the community. WHO *Monograph Series* No. 53. Geneva: WHO.

Kabir, M. and Chowdhury, R.I. 1993. *Infant and child mortality levels and trends in Bangladesh: secondary analysis of the Bangladesh Fertility Survey, 1989.* Dhaka: National Institute of Population Research and Training (NIPORT).

Kaiser, L.L. and Allen, L.H. 2002. Position of the American dietic association: nutrition and lifestyle for a healthy pregnancy outcome. *J. Am. Diet. Assoc.*, **102**: 1479-1490.

Kalita, P., Choudhury, H. and Borah, M. 2002. An econometric study of some selected socio- demographic variables on fertility by age group. *Man in Ind.*, **82**: 453- 458.

Kamal, N., Saha, U.R., Khan, M. and Bairagi,R. 2007. Use of periodic abstinence in Bangladesh : do they really understand. *J. Biosoc. Sci.*, **39**:27-40.

Kanitkar, T. and Sinha, R.K. 1989. "Antenatal care services in five states of India". In: *Population Transition in India,* edited by Singh, S.N., Premi, M.K., Bhatia, P.S., and Bose, A. Delhi: B.R. Publishing Corporation.

Kannan, K.P. 1991. *Health status in rural Kerala. A study of the linkages between socio-economic status and health status.* Integrated Rural Technology Centre of the Kerala Sastra Sahitya Parishad.

Kanungo, J. and Mohanta, D.L. 2004. Reproductive and child health care status of different social groups of India: an investigation into National Family Health Survey-II. *Man in Ind.*, **84**:15-31.

Kapil, V. 1990. Promotion of safe motherhood in India. *Ind. Pediatrc.*, **27**:232-238.

Kapoor, A. K. and Kshatriya, G. K. 2000. Fertility and mortality differentials among selected Tribal population groups of North- Western and Eastern India. *J. Biosoc Sci.*, **32**:253-264

Kenedy, G., Nante, G., Brouwer, I.D. and Kok, FJ. 2005. Does living in an urban environment confer advantages for childhood nutritional status? Analysis of disparities in nutritional status by wealth and residence in Angola, Central African Republic and Senegal. *Pub. Health. Nutr.*, **9**: 187-193.

Khan, M.E. and Prasad, C.V.S. 1983. "Family Planning practices India". In: *Second All India.* Baroda: Operation Research Group.

Khongsdier, R.1993. Fertility differentials among the War Khasi of Meghalaya. *J. Anthrop. Surv. Ind.*, **42**: 199-206

Khongsdier, R. 1997. The War Khasi of Meghalaya: implications of variation in adult body dimensions. *J. Hum. Ecol. (Spl. Issue)*, **6:** 299-305.

Khongsdier, R. 2001. BMI of adult males in 12 populations of Northeast India. *Ann. Hum. Biol.*, **28:** 374-383.

Khongsdier, R. 2002. "Fertility and Mortality Differentials among the War Khasi of Meghalaya". In: *Tribal Studies in North East India,* edited by Sengupta, S. New Delhi: Mittal Publication.

Khongsdier, R. 2002a. Body mass index and morbidity in adult males of the War Khasi in North east India. *Eur. J. of Clin. Nutr.*, **56**: 484-489.

Khongsdier, R. 2003. "Maternal Education in Relation to the Indicators of Health and Development in Northeast India". In: *Dimensions of Research in Indian Anthropology*, edited by Vijay, S.S. and Pradip, K.S. New Delhi: Serials Publications.

Khongsdier, R. 2005a. Body mass index and morbidity in relation to body composition: a cross-sectional study of a rural community in Northeast India. *Brit. J. Nutr.*, **93**:101-107.

Khongsdier, R. 2005c. *Demographic Genetics of an Indian Population.* Itanagar& New Delhi: Himalayan Publishers.

Khongsdier, R. 2006. Malnutrition, social inequality and natural selection in human population. *J. Hum. Ecol. (Spl. Issue).*, **14**: 53-67.

Khongsdier, R. and Ghosh, A.K. 1996. "Relevance of population study in physical anthropology". In: *Communities of North- East India,* edited by Ahmed Das, F. and Barua, I. New Delhi: Mittal Publications.

Khongsdier, R. and Mukherjee, N. 2003a. Effects of heterosis on growth in height and its segments: a cross- sectional study of the Khasi girls in Northeast India. *Ann. Hum. Biol.*, **30**: 605-621.

Khongsdier, R. and Mukherjee, N. 2003b. Growth and nutritional status of Khasi boys in Northeast India relating to exogamous marriages and socioeconomic classes. *Am. J. Phys. Anthrop.*, **122**: 162-170.

Khongsdier, R., Nsarangbe, A. and Phimu, A. 2001. A bio-anthropological study of the Pnar of Jatinga in North Cachar Hills of Assam. *J. Ind. Anthrop. Soc.*, **36**: 213-222.

Khongsdier, R., Varte, R. and Mukherjee, N. 2005. Excess male chronic energy deficiency among adolescents: a cross- sectional study in the context of patrilineal and matrilineal societies in Northeast India. *Eur.J. Clin. Nutr.*, **59**: 1007-1014.

Kim, S.A., Yount, K.M., Ramakrishna, U.and Martorell, R., 2007. The relationship between parity and overweight varies with household wealth and National development. *Int. J. Epi.*, **36**:93-101.

Kirkwood HZ, B. and Edmond, K, 2001. Family and community practices that promote child survival, growth and development: a review of the evidence. Paper commissioned by the Development of Child and Adolescent Health and Development Family and Community Health, WHO.

Koc., I. 2000. Determinants of contraceptive use and method choice in Turkey. *J. Biosoc. Sci.*, **32**: 329-342.

Koening, M. Jeejeebhoy, S. and Sridhar, S. 1998. Investigating women's gynecological morbidity in India: not Just another KAP Survey. *Reprod. health Matters.* **6**:84-97.

Kost, K. and Amin, S. 1992. Reproductive and socio-economic determinants of child survival confounded that, interactive and age dependent effect. *Soc. Biol.*, **39**: 139-150

Knodel, J. and Jones, G.W. 1996. Does promoting girls' schooling miss the mark? *Popn. Dev. Rev.*, **22**: 683-702.

Knodel, J., Sottipong, G.R., Soiwatcharin, P. and Pracca, S. 1999. Religion and reproduction: Muslims in Budhist Thailand. *Popn. Stud.*, **53**:149-164.

Kollehlon, K.T. 1994. Religious affiliation and fertility in Libya. *J. Biosoc. Sci.*, **26**: 493-507.

Kulu, H., Vikat, A. and Andersson, G. 2006. *Settlement size and fertility in the Nordic Countries.* Paper approved by Gerda Ruth Neyer. *"http://www.demogr.mpg.de/paper/working/wp-2006-024.pdf"*

Kullu, H. 2005. Migration and fertility: competing hypothesis re-examined. *Eur. J. Popn.*, **21**:51-87

Kullu, H. 2006 Fertility of internal migrants: comparison between Austria and Poland. *Popn, Space and Place.*, **12**:147-170.

Kumar, A.K.S. 1995. "Women's Capabilities and Infant Mortality: Lessons from Manipur". In: *Women's Health in India Risk and Vulnerability*, edited by Gupta, M.D., Chen, L.C. and Krishnan, T.N. Delhi: Bombay Oxford University, Press.

Krishnaji N. and James, K.S. 2005. Religion and fertility: a comment. *Econ. and Pol. Weekly.* Jan. **29**: 455-458

Lata Mridula, K., Kedai, Geeta Prohit, C.K. and Bhavar, B.S., 2000. Comparative study of under five deaths and family planning status in District Ahmedabab. *Ind. J. of Com. Med.*, **3**: 25-.

Lesthaeghe, R. and Jolly, C. 1995. The start of the sub-Saharan fertility transition: some answers and many questions. *J. Int. Dev.*, **7**: 25-45

Letamo, G. 1996. Contributions of the proximate determinants to fertility change in Botswana. *J. Biosoc.Sci.*, **28**:325-338

Levin, H., Pollott E., Galloway, R. and Mc Guire, J. 1993. "Micronutrient deficiency disorders". In: *Disease Control Priorities in Developing Countries*, edited by Jamison, D., Mosely, H., Measham A. and Bobadilla, J.L. New York: Oxford University Press.

Lee, H.S., Kim, MS., Kim, YJ. and Kim, W.Y. 2006. Iron status and its association with pregnancy outcome in Korean pregnant women. *Eur. J. Clin. Nutr.*, **60**: 1130-1135.

Levine, R.E., Cross, H.E., Chhabra, S. and Viswanathan, H. 1992. Quality of health and family planning services in rural Uttar Pradesh: The client's view. *Demo. Ind.*, **21**: 247-65.

Limbu, D. and Khongsdier, R. 2000. "The Semsa: A Population Genetic Study". In: *Contemporary Research in Anthropology*, edited by Khongsdier, R. Delhi: Commonwealth.

Loaize E. 1997. *Maternal nutritional status. DHS. Comparative studies* No.24. USA: Macro International Inc.

Lloyd, C.B. 1991. The contribution of the World Fertility Survey to an understanding of the relationship between women's work and fertility. *Stud. Fam. Plann.*, **24**:144-

Macassa, G., Ghilagaber, G., Bernhardt, E. and Burstrom, B. 2003. Trends in infant and child mortality in Mazambique during and after a period of conflict. *Public Health.*, **117**: 221-7.

Macassa, G., Ghilagaber, G., Bernhardt, E. and Burstrom, B.2003. Inequalities in child mortality in Mozambique: differentials by parental socio-economic position. *Soc. Sci. Med.*, **57**: 2255-2264.

Magadi, M.A., Madise, N.J. and Rodrigues, R.N. 2000. Frequency and timing of antenatal care in Kenya: explaining the variations between women of different communities. *Soc. Sci. Med.*, **51**:551-561.

Mahadevan, K. 1986. *Mortality, Biology and Society; Analytical, Framework and Conceptual Model.* New Delhi: Tejeshwar Singh for Sage Publication Pvt. Ltds.

Maitra, K., Johnson, J.D., Singh, K.K. and Tsui, A.O. 2001. Prevalence of self- reported symptoms of reproductive tract infections among recently pregnant women in Utter Pradesh, India. *J. Biosoc. Sci.*, **33**.

Majumder, P.P., Shankar, B.U., Basu, A., Malhotra, K.C., Gupta, R., Mukhopadhyay, B., Vijayakumar, M. and Roy, S.K. 1990. Anthropometric variation in India: a statistical appraisal. *Curr. Anthrop.*, **31**: 94-103.

Martorell, R. and Ho, T.J. 1984. Malnutrition, morbidity and mortality. *Popn. Dev. Rev. (Suppl.)*, **10:** 49-68.

Mathai M. 2005. Patterns of routine antenatal care for low risk- pregnancy: RHL Commentary. *The WHO Reproductive Health Library*, No. 8, Oxford: Update Software Ltd.

Mathai. S. T. 1989. "Women and the health system". In: *Women and Nutrition in India*, edited by Gopalan, C. and Kaur, S. New Delhi: Nutrition Foundation of India.

Matsumura, M. and Gubhaju, B. 2001. Women's status, household structure and the utilization of maternal health services in Nepal. *Asia- Pac. Popn. J.*, **16**: 23-44.

Maurya, N., Sachdeva, M.P. and Kalla, A.K. 2005. Contraceptive prevalence in an isolated population of Bay of Bengal. *Anthrop.*, 7:53-56.

Mayank, S., Bahl, R., Rattan, A. and Bhandari, N. 2001. Prevalence and correlates of morbidity in pregnant women in urban slum of New Delhi. *Asia. Pac. Popn. J.*, 29-44

McDonagh, M.1996. Is antenatal care effective in reducing maternal morbidity and mortality? *Health Pol. and Plann.*, **11**: 1-15.

McIntosh, C.A. and Finkle, J.L. 1995. The Cairo conference on population and development: a new paradigm? *Popn. Dev. Rev.*, **21**: 223-260.

Medhi, G.K., Barua, A. and Mahanta, J. 2006. Growth and nutritional status of school age children (6-14 years) of tea garden worker of Assam. *J. Hum. Eco.*, **19**:83-85

Midhet, F., Becker, S. and Berendes, H.W. 1998. Contextual determinants of maternal mortality in rural Pakistan. *Soc. Sci. Med.*, **46**: 1587-98.

Mitra, A. 1985. "The Nutrition Situation in India". In: *Nutrition and Development*, edited by Biswas, M. and Anderson, P. Oxford: Oxford University Press.

Ministry of Health and Family Welfare, MHFW. 1997. *Reproductive and Child Health programme: Schemes for Implementation.* Department of Family Welfare, MHFW, New Delhi.

Ministry of Health and Family Welfare, MHFW. 2000. *National Population Policy, 2000.* New Delhi: Department of Family Welfare, MOHFR.

Ministry of Health and Family Welfare, MOHFW.1998b. *Manual on Community Needs Assessment Approach in Family Welfare Programme*. New Delhi: Department of Family Welfare, MOHFW.

Ministry of Health and Family Welfare, MOHFW.1991.*Family Welfare Programme in India*: Year Book, 1989-90. New Delhi: Department of Family Welfare, MOHFW.

Mishra,V. K., Robert, D. Retherford, P.S. N. and Feeney, G. 1999. Reasons for discontinuing and not intending to use contraception in India. Mumbai: IIPS

Mishra, U.S. and Ramanathan, M. 2002. Delivery – related complications and determinants of caesarean section rates in India. *Health. Pol. Plann.*, **17:** 90-98.

Mitra, S.N. and Nawab, M. F. 1994. *Bangladesh Demographic and Health Survey 1993-94.* Calverton: Macro International Inc.

Mitra, A. 1985. "The Nutrition Situation in India". In: *Nutrition and Development*, edited by Biswas, M. and Andersen, P. Oxford: Oxford University Press.

Mitra, M. and Tiwari, A. 1997. Malnutrition in preschool children- A study of Brahmin Rawat and Teli Preschool Children of Raipur. *Annual Conference of Indian Society of Human Genetics*: 16th and 18th Dec. 1997 XXIII. New Delhi.

Mohammed, H. Q. 1998. *KAP study on reproductive health among adolescents and youth in Assint Governorate, Egypt.* Summary of the Final report prepared for the Women's Studies Project Family Health International. The Research Management Unit of the National Population Council, Cairo, Egypt.

Mohsin, M., Bauman, A.E. and Jalaludin, B. 2006. The influence of antenatal and maternal factors on stillbirths and neonatal deaths in New South Wales, Australia. *J. Biosoc. Sci.*, **38**, 643-657.

Monem, A. and Ali, M. 2006. Levels and differentials of pregnancy loss and reproductive morbidity in four Arab Countries. Presentation made at Forum 10, Cairo, Egypt, 29 October- 2 November.

Moreno, L. and Goldman, N. 1991. Contraceptive failure rates in developing countries: evidence from the demographic and health surveys. *Int. Fam. Plann. Perspect.*, **17** (2):44-49.

Mosely, W. H. and Chen, L.C. 1984. An analytical framework for the study of child survival in developing countries. *Popn. Dev. Rev.* (Suppl), **10**:25-45

Mukherjee, N. 2002. Study on Demography and Growth pattern among the Khasi Children of Shillong. Unpublished PhD Thesis. Department of Anthropology, NEHU Shillong.

Mukhopadhyay, B. 1981. A comparative macro demographic study of two communities in Coastal Midnapur district, West Bengal. *J. Biosoc. Sci.*, **13**: 479-489.

Mumtaz, Z. and Salway, S.M. 2007. Gender, pregnancy and the uptake of antenatal care, services in Pakistan. *Soc. of Health and Illness.*, **29**: 1-26.

Murry, B., Sachdeva, M.P. and Kalla, A.K. 2005. Estimates of fertility and mortality differentials among the Lotha Nagas of Nagaland. *Anthrop.*, **7:** 45-52

Murthi, M., Guio, A.C. and Dreze, J. 1995. Mortility, fertility and gender bias in India: a district- level analysis. *Popn. Dev. Rev.*, **21**: 745-782

Mutharayappa, R. 2005. A study of maternal health services in three districts of Karnataka. *J. Ind. Anthrop. Soc.*, **40**: 87-99.

Nagdeve, D. and Bharati, D. 2003. Urban- Rural differentials in maternal and child health in Andhara Pradesh, India. Rural and Remote health (on line) *http:rrh.deakin.edu.au*

Naidu, A.N. and Rao, N.P. 1994. Body mass index: a measure of the nutritional situation in Indian populations. *Eur. J. Clin. Nutr. (Suppl. 3)*, **48**: 131-140.

Nath, D.C., Land, KC. and Goswami, G. 1994. Effects of the status of women on the first-birth interval in Indian Urban society. *J. Biosoc. Sci.*, **1**: 55-69.

National Family Health Survey, NFHS. 1998. *National Family Health Survey Subjects report on Infant and Child Mortality*: Mumbai: IIPS

Nayar, P.B.K.1986. "Factors in fertility decline in Karela". In: *Fertility and Mortality Theory, Methodology and Empirical Issues,* edited by Mahadevan K. New Delhi: Sage Publications.

Norgan, N.G.1994. Population differences in body composition in relation to the body mass. *Eur.J. Clin. Nutr. (Suppl.),* **48**:10-27.

Nube, M., Asenso-Okyere, W.K. and van den Boom, G. J. M. 1998. Body mass index as indicator of standard of living in developing countries. *Eur. J. Clin. Nutr.*, **52**: 136-144.

Oladepo, OT., Sule-Odu, A., Olatunji, O. and Daniel, O. 2005. Near miss obstetric events and maternal deaths in Sagamu, Nigeria : a retrospective study. *Reprod. Health.***1**: 2-9.

Omariba, W.R.D. 2006. Women's educational attainment intergenerational patterns of fertility behaviour in Keniya. *J. Biosoc. Sci.,* **38**: 449-479.

Ormond, B.A.- Zuckerman, S. and Lhila, A. 2000. Rural/ urban differences in health care are not uniform across States. *National Survey of American's Families* Series B. No. B-1 Washington, D.C: Urban Institute.

Osmani, S.R. (ed.). 1992. *Nutrition and Poverty.* Oxford: Clarendon Press.

Pachauri, S. 1991. A reproductive health approach to the population problem. *Demo. Ind.*, **20:** 155-162.

Pandey, G.D. and Tiwary, R.S. 1993. Socio-cultural characteristics and health – seeking behaviour of the Hill Korwas. *J. Fam. Wel.*, **39**: 44-48.

Park, K. 1997. *Preventive and Social Medicine.* 15th Ed. Jabalpur: M/s Banarsidas Bhanot.

Park, K. 1994. *Preventive and Social medicine.* Jabalpur: Banarsidas Bhanot Publishers

Parkhurst, J. and Rahman SA. 2007. Non- professional health practitioners and referrals to facilities: lessons from maternal care in Bangladesh. *Health Pol. and Plann.*, **22**:149-155.

Pemberton, B.R. 1966. *Report on the Eastern- Frontier of British India.* Gauwahati. (Reprint)

Peterson S.A.1999. Marriage structure and contraception in Niger. *J. Biosoc. Sci.*, **32**: 253-264.

Philliber Susan, G. and Philliber William, W. 1985. Social and psychological perspectives on voluntary sterilization: a review. *Stud. Fam. Plann.*, **19:** 467-496.

Pillai, G., 1993. Reducing deaths from pregnancy and childbirth, Asia. *Links Health and Dev. Report.* **9**: 5-

Pokhrel, S. and Sauerborn, R. 2004. Household decision-making on child health care in developing countries: the case of Nepal. *Health Pol. Plann.*, **18** : 225-231.

Poovan, P., Fesshatsion, K.and Kwast, B.E. 1990. A maternity waiting home reduces obstetric catastrophes. *World Health Forum*, **11**: 440- 445.

Popkin, B.M. 1998. The nutrition transition and its health implications in lower- income countries. *Pub. Health Nutr.*, **1**: 5-22.

Popkin, B.M. 2002. An overview on the nutrition transition and its health implication: the Bellagio meeting. *Pub. Health Nutr.*, **5**: 93-103

Poston, D. L. Jr. 2000. Social and economic development and the fertility transitions in mainland China and Taiwan. *Popn. Dev. Rev. (Suppl.),* **26**: 40-60.

Prakasam, C.P. and Narveker, S. 2005. Water and child morbidity in Indian States. *Popn. Env. Centre 2* .

Pukhrambam, R., Sanayaima, H., Manihar, Y., Praveen, Sh. and Khelendra, R.K., 2005. Evaluation of measles vaccine efficacy by field method. *Indian Med. Gaz.*, **139**: 441-443.

Rahman, A. and Chowdhury, S. 2007. Determinants of chronic malnutrition among preschool children in Bangladesh. *J. Biosoc. Sci.*, **39**: 161-173.

Rajaram S., Sunil, T.S. and Zottarelli L.K. 2003. An analysis of childhood malnutrition in Kerala and Goa. *J. Biosoc. Sci.*, **35**: 335-351.

Ramesh, B.M., Gulati, S.C. and Robert, D. 1996. *Contraceptive use in India.* Mumbai: IIPS.

Ram, F. and Singh, A. 2006. Is antenatal care effective in improving maternal health in rural Uttar Pradesh ? Evidence from a district level household survey. *J. Biosoc. Sci.*, **38** :433-448.

Rao, N.B., Kulkarni, P.M. and Rayappa, P.H. 1986. Determinants of Fertility Decline- A Study of Rural Karnataka, New Delhi: South Asian Publishers.

Rao, P.D. and Babu, M.S. 2005. Knowledge and use of contraception among Racha Koyas of Andhra Pradesh. *Anthrop.*, **7**: 115-119.

Rao, S.R., Caleb L., Khan M.E. and W. John, 2001. Safer maternity in rural Utter Pradesh: do Primary Health Services contributes? *Health Pol. and Plann.*, **16**: 256-63.

Rao, G.R., Ladu Singh, L. and Pritamjit, R. 2004. Nutritional status of children in North-East India. *Asia. Pac., Popn., J.,* **19**: 39-56.

Rao K.M., Kumar, R.H., Venkaiah, K. and Brahman G.N.V. 2006. Nutritional status of Saharia-a primirtive tribe of Rajasthan. *J. Hum. Ecol.*, **19**: 117-123.

Ravindran, T.K.S. 1996. "Social Inequality and Child Health Status". In: *Health, Poverty and Development in India,* edited by Monica D. G., Lincoln C. C., and Krishnan, T.N. Delhi: Oxford University Press.

Ray, S.K., Mishra, R., Biswas, R., Kumar, S., Halder, A. and Chatterjee, T. 2004. Nutritional status of pavement dwellers children of Calcutta city. *Ind. J. Pub. Health.*, **43**:49-54.

Reddy Gal Ch, A., Harikumer R., Kumer, S., Brahman, G.N.V. and Balakrishna, N. V. 2006. Diet and nutritional status of rural preschool children in the state of Orissa. *J. Hum. Eco.*, **19**: 205-214.

Reddy, B.R. 1998. Body mass index and its association with socioeconomic and behavioral variables among socio economically heterogeneous populations of Andhra Pradesh, India. *Hum. Biol.*, **70**: 901-917.

Redaiah, V.P. and Kapoor, S.K. 1992. Socio- biological factors in under five deaths. *Ind. J. Pediatrc.*, **59**:567-571.

Regassa, N. 2007. Socio- economic corerelates of high fertility among low contraceptive communities of Southern Ethopia. *J. Hum. Ecol.*, **21**: 203-213.

Retherford, R. D. and Ramesh, B.M. 1996. Fertility and contraceptive use in Tamil Nadu, Andhra Pradesh and Utter Pradesh. Mumbai: IIPS

Retherford, R.D., Thapa, S. and De Silva, V. 1989 Strength of fertility motivation: its effects on contraceptive use in rural Sri-Lanka. *Asia Pac. Popn.*, **4**:21-44.

Robinson, W. and Cleland, J. 1992. "The Influenceof Contraceptive Cost on the Demand for Children." In: *Family Planning Programes and Fertility*, edited by Philips James, F Ross John, A. Oxford: Clarendon Press.

Rolland – Cachera, M.F. 1993. Body composition during adolescence: methods, limitations and determinants. *Hormone Research (Suppl.*3), **39**: 25-40.

Ronsmans, C., Achadi, E., Cohen, S. and Zazri, A. 1997. Women's recall of obstetric complications in South Kalimantan, Indonesia. *Stud. Fam. Plann.*, **28**: 203-213.

Rooney, G.I.F.1992. *Antenatal care and maternal health: how effective is it*? Document WHO/ MSM/ 92.4. World Health Organisation, Geneva.

Roy, J. 1973. *History of Manipur* 2nd ed. Calcutta: East light Book house.

Roy, K. 2006. A study on nutritional status of rural Santals of Birbhum District of West Bengal. *J. Ind. Anthrop. Soc.*, **41**:199-204.

Roy, N.C. 2000. Use of mid- upper arm circumference for evaluation of nutritional status of children and for identification of high- risk groups for malnutrition in rural Bangladesh. *J. Health. Popn. Nutr.*, **18**: 171-180.

Rush, D. 2000. Nutrition and maternal mortality in the developing world. *Am. J Clin. Nutr.*, **72** (Suppl): 212-240

Rutstein, S.O. 1984. Infant and child mortality: Levels, tends and demographic differentials. WFS Comparative Studies, No. 43.

Rutstein, S.O. 2000. Factors associated with trends in infant and child mortality in developing countries during the 1990S. *Bull. WHO.*, **78**: 1256-1270.

Saavala, M. 1999. Understanding the prevalence of female sterilization in rural South India. *Stud. Fam. Plann.*, **30**: 288-301.

Sadana, R. 2000. Measuring reproductive health: review of community-based approaches. *Bull. WHO.*, **78:** 641-654.

Sahoo, S. and Panda, B. 2006. A study of nutritional status of pregnant women of some villages in Balasore District, Orissa. *J. Hum. Eco.*, **20**:227-232.

Sahu, A.B. 2006. Influence of female age at marriage on fertility and child loss: a study of selected state in India. Unpublished M. phil. dissertation. Mumbai International Institute of Population Sciences.

Sai Fred, T. and Nassim, J. 1989. The need for reproductive health approach. *Inter. J. Gynea. Obstret.*, (Suppl. 3) **18** (Cited in Karkal, 1996).

Saikia, U.S., Steele, R. and Dasvarma, G. 2001. Culture, religion and reproductive behaviour in two indigenous communities of North East India: A discussion on some preliminary findings. Paper presented at XXIV IUSSP general Conference, 18-24th August, 2001, Salvador, Brazil.

Sankhala, A., Sankhla, A.K., Bhatnagar, B. and Singh, A. 2004. Dietary status of children of Udaipur District. *Anthrop.*, **6**: 257-259.

Sarkar, N.C. 2002. "Bio- Demographic Study of the Mukloms of Changlang, Arunachal Pradesh". In: Ethnic Groups, Cututral Continuities and Social Change in North East India, edited by Barua, I., Sengupta, S. and Das, D.D. New Delhi: Mittal Publications.

Schellenberg, J.R., Abdula, S., Nalhan, R., Mukasa, O., Marchant, T.J., Kikumbh, N., Mushi, A.K., Mponda, H., Mirja, H., Mshinda, H., Tanner, M. and Lengder, C. 2002. Effect of large- scale social marketing of insecticide- treated nets on child survival in rural Tanzania. *Lancet.* **375** : 1241-7.

Schneider, H. 1998. Screening for sexually transmitted diseases in rural South African women. *Sexually Trans., Infect.*, **74** (Supple 1):147-152.

Segraves, B.A. 1977. "The Malthusian Proposition and Nutritional Stress: Differing implications for man and for Society". In: *Malnutrition, Behaviour, and Social Organisation,* edited by Greene L.S. New York: Academic Press.

Sekiyama, M. and Ohtsuka, R. 2005. Significant effects of birth- related biological factors on pre-adolescent nutritional status among rural Sundanese in West Java, Indonesia. *J. Biosoc. Sci.*, **37**:413-426

Sen, T.1994. *A Guide to Anthropometry.* Calcutta: The World Press Pvt. Ltd.

Sengupta, S. and Gogoi, A. 1995. Effects of socio- cultural factors on fertility and mortality among the Oraons of Assam: a preliminary study. *J. Hum. Ecol. (Spl issue)*, **6**:335-341.

Seshadri, S.1997. "Nutritional anaemia in South Asia". In: *Malnutrition in South Asia. A Regional Profile. Katmandu,* edited by Gillepsie S. Regional Office for South Asia, UNICEF: New Delhi.

Shafique, S., Akhter, N., Stallkamp, G., dePee, S., Panagides, D. and Bloom, W.M. 2007. Trends of under – and overweight among rural and urban poor women indicate the double burden of malnutrition in Bangladesh. *Int. J. Epi.*, **10**: 1306-

Sharif, A.S. 1999. *India: Human Development Report, National Council for Applied Economic Research.* Delhi: Oxford University Press.

Sharma, P.K. and Parthi, K.2004. Reproductive health services in Punjab: evidence of access for Schedule Caste and non- Schedule Castes. *Soc. Change.*, **34:** 40-65.

Sharma, S., Mcgreevey, W., Kaajilal, B. and Hotchkiss, D.R. 2002. Reproductive and child health accounts; an application to Rajasthan. *Health Pol. and Plann.*, **17**: 314-321.

Shetty, P.S. and James, W.P.T. 1994. *Body mass index: a measure of chronic energy deficiency in adults.* Rome: FAO Food and Nutrition Paper 56.

Shetty, P.S. 2002. Nutrition transition in India. *Pub. Health. Nutr.*, **5**: 175-182.

Singh, J.S. 2006. Ethnic variation in fertility patterns among four communities of Manipur. *J.Hum.Ecol.*, **20**: 1-9.

Sinha, R.K. 1987. Impacts of age at marriage on fertility and completed family size in eastern Rajasthan. *J. Fam. Wel.*, **34**:22-40.

Singh, U.P. 2003. The reproductive behavior and opportunity of natural selection among Bhoksa Tribals of Northern India. *Ind. J. Phys. Anthrop. Hum. Genet.*, **22:** 205-221.

Singh W, Y. 1966. Early History of Manipur.

Singh S.P., Malhotra P., Sidhu L.S. and Singh P.P. 2007. Nutritional assessment of boys of the Spitian tribe of the Himalayas. *J.Hum.Ecol.*, **21**:279-284.

Som, S. Pal, M., Bhattacharya, B., Bharati, S. and Bharati, P. 2006. Socioeconomic differentials in nutritional status of children in the states of West Bengal and Assam, India. *J. BioSoc. Sci.*, **38**: 625-642.

Sommerfelt, A. E. and Kathrya, S. 1999. *Children's nutritional status*. DHS Comparative studies No-12. USA: Macro International Inc.

Sowmini, C.V. and Sankara Sarma, P. 2004. Reproductive morbidity among contraceptive morbidity uses: need for quality services. *J. Fam. Wel.*, **50:** 31-37.

Snedecor, G.W. and Cochran, W.G. 1967. *Statistical methods*, 6th edition. Iowa: The Iowa State University Press.

Sserunjogi, L., Scheutz, F. and Whyte, R.S. 2003. Postnatal anaemic: neglected problems and missed opportunities in Uganda. *Health. Pol. Plann.*, **18**: 225-231.

Stinson, S. 1998. "Educational Potential and Attainment: Long Term Implication of Child Undernutrition." In: *Human Biology and Social Inequality*, edited by Strickland, S.S. and Shetty, P.S. Cambridge: Cambridge University Press.

Stolzfuz, R., Rebecca, J. and Drefuss M.L. 1998. *Guidelines for the use of iron supplement to prevent and treat iron deficiency anaemia*. Nutritional Anaemia Consultative Group. Washington DC: International Life Sciences Institute Press.

Strickland, S.S. and Tuffrey, V.R. 1997. *Form and Function: A Study of Nutrition, Adaptation and Social Inequality in Three Gurung Villages of the Nepal Himalayas*. London: Smith-Gordon and Co.

Strickland, S.S and Ulijaszek, S.J. 1993. Body mass index, ageing and differential reported morbidity in rural Sawarak. *Eur. J. Clin. Nutr.*, **47:** 9-19.

Sturley, A.E.1998. Perceptions of contraception in rural Nepal. Unpublished Ph.D. dissertation. Honolulu: School of Public Health, University of Hawaii.

Sugathan, K.S., Mishra, V. and Retherford, R.D. 2001. *Promoting Institutional Deliveries in Rural India: The Role of Antenatal Care Services*. Mumbai: IIPS.

Sunekha, G. 1989. Utilization of health services by characteristics of households. A urban slum study. Unpublished M.Phil Dissertation, Trivandrum: Centre for development Studies.

Susan, E. 2004. Use of maternal health services in rural China. *Popn. Stud.*, **58** : 3-19.

Swar-Eldahab A. 1993. Constraints on effective family planning in urban Sudan. *Stud. Fam. Plann.*, **24** :366-374.

Swaminathan, S.A.A. 2004. Muslims, learn from Bangladesh. *Times of India*, **12**th September.

Taffa, N., Chepngeno, G. and Amuyunzu-Nyaneongo, M. 2005. Child morbidity and health care utilization in the slum of Nairobi, Kenya. *J. Trop. Pediatc.*, **10**.1093-

Tagoe, E. 1995. "Maternal Education and Infant/ Child Morbidity in Ghana: The case of Diarrahea. Evidence from the Ghana DHS". In: *Women Position and Demographic Change in Sub- Saharan Africa*, edited by Makinwa and Jemen: IUSSP.

Teller, H. and Yimer, G. 2000. Levels and determinants of malnutrition in adolescent and adult women in Southern Ethiopia. *Etho. J. Health. Dev.*, **14**: 57-66.

Teran, M.M. 1991. Early feeding patterns and children's health in Mexico. DHS. World Conference, August, 5-7. Proceeding Vol. 1. 451-474. Washington D.C.

Thangaleela, T. and Vijayalaxmi, P.1994. Impact of anemia in pregnancy. *Ind. J. Nutr. Dietet.*, **31**: 251-256.

Thang, N.M. and Huong, V.T., 2003 Changes in contraceptive use in Veitnam. *J. Biosoc.Sci.*, **35**:527-543.

Thonneau, P., Toure, B., Cantrelle, D., Barry, P.M. and Papiernik, E. 1992. Risk factors for maternal mortality : results of a care-controlled study conducted in Conakry (Guinea). *Int. J. Gynea. Obstet.*, **39**: 87-92.

Timaeus, I.M. and Lush, L. 1995. Intra- urban differentials in child health. *Health. Tran. Rev.*, **5:** 163-190.

Torum, B., Davies, W., Livingstone, M., Paoliss, B., Sackett, R. and Spurr, G.B. 1996. Energy requirements and dietary energy recommendations for children and adolescents 1 to 18 years old. *Eur. J. Clin. Nutr.*, **50**:S37-S81

Tribal Development Department, TDD. 1994. *Manipur Gazette*. Government of Manipur: Secretariat.

Trussell, J. and Pebley, A.R. 1984. The potential impact of changes in fertility on infant, child, and maternal mortality. *Stud. Fam. Plann.*, **15**: 701-711.

Uauy, R. and Kain, J. 2002. The epidemiological transition: need to incorporate obesity prevention into nutrition programmes. *Pub. Health Nutr.*, **5**: 223-229.

UNICEF, India. 1991. *Children and Women in India: A Situation Analysis*. New Delhi: UNICEF.

United Nation, UN. 1985. *Socio economic Differentials in Child Mortality in Developing Countries*. New York: Department of International Economics and Social Affairs.

United Nations, UN. 1994. *Report of the International Conference on Population and Development, Cairo.* New York: United Nations.

United Nations, UN. 1999. *The Demographic Yearbook Historical Supplement 1948-1997. CD- Rom (DYB-CD).* United Nations: New York.

Uppal, M., Kumari, K. and Sidhu, S. 2005. Clinical assessment of health and nutritional status of scheduled caste preschool children of Amritsar. *Anthrop.*, 7:169-171.

Varte, R. 2006. Health and Nutritional status of the Hmars of Aizawl District, Mizoram. Unpublished PhD thesis. Department of Anthropology, NEHU Shillong.

Vaessen, M. 1991. "Data needs for the Future". In proceedings of the Demographic and Health Surveys World Conference, August 5-7. Washington DC. Institute for Resource Development/ Macro International, Demographic and Health Surveys (DHS), Columbia, MD. **3**: 179-185.

Veleti, K. 2001. Occupational status of urban couples and their fertility: a study. *Man in Ind.*, **81**: 377- 384.

Vella, V., Tomkins, A., Borghesi, A., Migliori, G.B., Adriko, B.C. and Crevatin, E. 1992. Determinants of child nutrition and mortality in northwest Uganda. *Bull. World. Health. Org.*, **70:** 637-643.

Verma, G.R., Babu, B.V. and Rohini, A. 1999. A study on fertility and its socio-demographic determinants among rural population of West Godavari district, Andhra Pradesh. *J. Hum. Ecol.*, **10**: 179-182.

Vlassoff, C. 1990. Fertility intentions and subsequent behaviour: a longitudinal study in rural India. *Stud. Fam. Plann.*, **21** (4): 216-225.

Visaria, P. and Gumber, A. 1996. "Socio- economic differentials in pattern of health care access and utilization". In: *Health, Poverty and Development in India,* edited by Das, M G., Lincoln Chen, C. and Krishnan, T.N. Delhi Oxford University Press.

Visaria, P., Visaria I. and Jain, A. 1995. Contraceptive use and Fertility in Inidia: A Case Study of Gujarat. New Delhi: Sage Publication.

Visweswara Rao, K., Balakrishna, N., Thimmayama, B.V.S. and Rao, P. 1990. Indices and critical limits of malnutrition for use among adults. *Man in Ind.*, **70**:351-367.

Visweswara Rao, K., Balakrishna, N. and Shatrugna, V. 1995. Variations in forms of malnutrition in well-to-do adults and the associated factors. *Man in Ind.*, **70:** 351-367.

Wagstaff, A. 2000. Socioeconomic inequalities in child mortality: comparisons across nine developing countries. *Bull. WHO.*, **78**: 19-29.

Wang, L. 2000. Determinants of child mortality and morbidity in China. *qdlnumultimedia@worldbank.org*

Wardatul, A. 2002. Women's education and fertility rates in developing countries, with special reference to Bangladesh. *Eubios J. Asian. Int. Bioethics.*, **12**:138-143

Winikhoff, B. and Sullivan, M.1987. The role of family planning in reducing maternal mortality. *Stud. Fam. Plann.*, **18**: 128-43.

WHO 1963. *Medical Assessment of Nutritional Status.* Report of a WHO Expert committee. Geneva: WHO.

WHO 1968. Nutritional anaemia. *Technical Report Series* No. 405. Geneva: WHO.

WHO 1971. Technical Report. Serial No 476.

WHO 1978. Primary health care: Report on the International Conference on the Primary Health Care (Cited in Karkal, 1996).

WHO 1980. *Manuals of basic techniques for a health laboratory.* Calcutta: Academic Publishers.

WHO 1983. *Measuring Change in Nutritional Status. Guidelines for Assessing the Nutritional Impact of Supplementary Feeding Programmes for Vulnerable Groups.* Geneva: WHO.

WHO 1986. Use and interpretation of anthropometric indicators of nutritional status. *Bull. WHO.*, **64**: 929-941

WHO 1990a. *Measuring Reproductive Morbidity.* Document No. WHO/MCW/90.4, Safe Motherhood Programme, Geneva.

WHO 1990. Diet, Nutrition and the Prevention of Chronic Disease. *Technical Report Series No. 797.* Geneva: WHO

WHO 1995. Physical status: The use and interpretation of Anthropometry. Report of WHO expert committee. *Technical Report Series, No* 854. Geneva: WHO.

WHO 2000a. *Turning the Tide of Malnutrition: Responding to the Challenge of the 21st Century,* Geneva: WHO. WHO/NHD/00.7.

WHO 2000b. *Nutrition for Health and Development: a Global Agenda for Combating Malnutrition.* WHO/NHD/ 00.6. Geneva: WHO.

WHO 2000. *A strategies assessment of Reproductive Health in the LAO People's Democratic Republic.* WHO/RHR/003. Geneva: WHO.

WHO 2000c. *The Asia Pacific Perspective: Redefining Obesity and its treatment.* Geneva: WHO.

WHO 2003. *Reproductive Health and Research,* WHO, 20 Avenue Appia, 1211 Geneva.

WHO 2002. *A Framework to Assist Countries in the Development and Strengthening of National and District Health Plans and Programmes in Reproductive Health.* Geneva: WHO

WHO 2006. Reproductive health indicators: Guidelines for their generation interpretation and analysis for global monitoring. Geneva: WHO.

Xingshan Cao. 2007. Does policy relaxation increase contraceptive flexibility: short-acting contraceptive use in China. *http://paa2007.priceton.edu/download.aspx?submission id=70470*

Yadav, K.N.S. and Yadav, S.S. 1999. Women's status and fertility in rural India- the most deprived among the deprived. *The history of the family.*, **4**: 209-228.

Yimer, G., 2000. Malnutrition among children in Southern Ethopia; levels and risk factors. *Ethiop. J. Health Dev.*, **14**:283-292.

Zehol, L. 1998. *Ethnicity in Manipur Experience, Issues and Perspectives.* New Delhi: Regency Publications.

Zhongwei, Z. 2006. Income inequality, unequal health care access and mortality in China. *Popn. Dev. Review.*, **32** : 461-483.

Zurayck, H., Khattab, H., Younis, N., El- Mouelhy, M. and Fadle, M. 1993. Concepts and measures of reproductive morbidity. *Health Tran. Rev.*, **3**: 17-40.

JNU LIBRARY
Acc No. 103833
Acc Date 17/3/08
Class No.
Sub.Head by
Enter by
Trans by