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 Loi 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 birth 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), Semsas (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 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 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 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 Sems (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). 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/m²) than in rural (21.81±2.81 kg/m²) areas (t = 2.17, p < 0.03). Considering the cut-off point of 18.5 kg/m² 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/m² 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 ≥ 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 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 < 45 years) 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.

DE 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 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 Loi 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.