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, Bishnupriyas 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 cooperate 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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Rural</th>
<th></th>
<th>Urban</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 312</td>
<td>%</td>
<td>N = 313</td>
<td>%</td>
</tr>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 24</td>
<td>48</td>
<td>15.38</td>
<td>47</td>
<td>15.02</td>
</tr>
<tr>
<td>25-29</td>
<td>66</td>
<td>21.15</td>
<td>56</td>
<td>17.89</td>
</tr>
<tr>
<td>30-34</td>
<td>68</td>
<td>21.79</td>
<td>61</td>
<td>19.49</td>
</tr>
<tr>
<td>35-39</td>
<td>56</td>
<td>17.95</td>
<td>60</td>
<td>19.17</td>
</tr>
<tr>
<td>≥ 40</td>
<td>74</td>
<td>23.72</td>
<td>89</td>
<td>28.43</td>
</tr>
<tr>
<td><strong>Income groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>150</td>
<td>48.08</td>
<td>54</td>
<td>17.25</td>
</tr>
<tr>
<td>Middle</td>
<td>71</td>
<td>22.76</td>
<td>124</td>
<td>39.62</td>
</tr>
<tr>
<td>High</td>
<td>91</td>
<td>29.17</td>
<td>135</td>
<td>43.13</td>
</tr>
<tr>
<td><strong>Educational groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>118</td>
<td>37.82</td>
<td>57</td>
<td>18.21</td>
</tr>
<tr>
<td>Primary</td>
<td>64</td>
<td>20.51</td>
<td>90</td>
<td>28.75</td>
</tr>
<tr>
<td>Secondary</td>
<td>92</td>
<td>29.49</td>
<td>105</td>
<td>33.55</td>
</tr>
<tr>
<td>High secondary</td>
<td>38</td>
<td>12.18</td>
<td>61</td>
<td>19.49</td>
</tr>
<tr>
<td><strong>Family Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small (&lt; 5 )</td>
<td>111</td>
<td>35.58</td>
<td>102</td>
<td>32.59</td>
</tr>
<tr>
<td>Average (5-6)</td>
<td>140</td>
<td>44.87</td>
<td>165</td>
<td>52.72</td>
</tr>
<tr>
<td>Large (&gt; 6 )</td>
<td>61</td>
<td>19.55</td>
<td>46</td>
<td>14.70</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hindu</td>
<td>197</td>
<td>63.14</td>
<td>40</td>
<td>12.78</td>
</tr>
<tr>
<td>Non-Hindu</td>
<td>115</td>
<td>36.86</td>
<td>273</td>
<td>87.22</td>
</tr>
</tbody>
</table>
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 antenatal 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/m² 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/m² should be classified as overweight for the Asian populations (WHO, 2000c). The BMI < 18.5 kg/m² 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/m²  
**Normal** = 18.5 – 23.0 kg/m²  
**Overweight** = > 23.0 kg/m²  

**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:

\[ Z = \frac{(\text{Child's measurement} - \text{Reference median})}{\text{Reference SD}} \]

where

Child’s measurement = height or weight of a given child at age X
Reference median = mean or 50th 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 Ulijaszek, 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 (\(\bar{X} + 4SD/\sqrt{N}\)) = High income group (HIG)

(\(\bar{X} - 4SD/\sqrt{N}\)) to (Mean + 4SD/\sqrt{N}) = Middle income group (MIG)

Below (\(\bar{X} - 4SD/\sqrt{N}\)) = 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 (\(\chi^2\)) 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, \( \leq 24, 25-29, 30-34, 35-39, 40-44 \) 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.