CHAPTER 3
DATABASE AND METHODOLOGY

This chapter elucidates database and details of methodology adopted and various analytical techniques employed to achieve the objectives of the study entitled “Socio-Economic Status and Livelihood Security of Rural Women in Punjab”.

3.1 Selection of the Study Area

Punjab is a small state with lot of spatial variability. “The variations in soil profile characteristics are much more distinct because of regional climatic differences”. (Department of Soil and Water Conservation, Punjab). The state can be divided into three zones on the basis of soil types.

This study has been carried out in all the three differentiated soil zones of the state of Punjab. These are:

1. South-Western Punjab
2. Central Punjab
3. Eastern Punjab

3.1.1 South-Western Punjab

“The region covers tehsils of Fazilka, Muktsar, Mansa, Bathinda and parts of Ferozepur which borders states of Haryana and Rajasthan in the south-west” (www.webindia123.com).

3.1.2 Central Punjab

“The soil covers the districts of Sangrur, Patiala, Ludhiana, Jalandhar, Kapurthala, Amritsar and parts of Gurdaspur, Ferozepur and fringes of Kharar tehsil and Ropar district” (www.webindia123.com).
3.1.3 Eastern Punjab

“The soil has developed in the sub-humid foothill areas bordering Himachal Pradesh, covering eastern part of Gurdaspur, Hoshiarpur, Ropar and north-eastern fringes of Patiala district” (www.webindia123.com).

3.2 Sampling Design

A multistage stratified random sampling technique was used to select districts, blocks, villages and households from three soil zones of Punjab.

Stage 1: Selection of districts

Three districts in all, one each from three zones were randomly selected. Bathinda district from southwestern Punjab, Amritsar from central and Hoshiarpur district from Eastern Punjab were randomly selected.

Stage 2: Selection of Blocks

A list of all development blocks falling under these selected districts (Amritsar, Bathinda and Hoshiarpur) of three soil zones was compiled. Two blocks were randomly selected from each district and list of the blocks is detailed in Table 3.1.

<table>
<thead>
<tr>
<th>Districts</th>
<th>Blocks selected</th>
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<tbody>
<tr>
<td>Amritsar</td>
<td>Chowgawan,</td>
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<td>Jandiala</td>
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<td>Hoshiarpur</td>
<td>Hoshiarpur II,</td>
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<td>Tanda</td>
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<td>Bathinda</td>
<td>Maur,</td>
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<td>Bathinda</td>
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</table>

Stage III: Selection of Villages

A separate list of villages falling under selected blocks was obtained from the concerned block development officers. Two villages from each block were randomly selected. In all 12 villages were selected. Names of these villages are given in Table 3.2.
Table 3.2: List of Sample Villages (Block-wise)

<table>
<thead>
<tr>
<th>District</th>
<th>Blocks</th>
<th>Villages</th>
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</thead>
<tbody>
<tr>
<td>Amritsar</td>
<td>1) Chowgawan</td>
<td>i) Thatha</td>
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<td></td>
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<td>ii) Thathi</td>
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<td>2) Jandiala</td>
<td>i) Gadli</td>
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<td>ii) Ballian Manjpur</td>
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<tr>
<td>Hoshiarpur</td>
<td>1) Hoshiarpur II</td>
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<td>ii) Tanuli</td>
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<td>2) Tanda</td>
<td>i) Rajpur Ghot</td>
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<td>ii) Bhulpur</td>
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<td>Bathinda</td>
<td>1) Maur</td>
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<td></td>
<td></td>
<td>ii) Bagher Muhabbat</td>
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<tr>
<td></td>
<td>2) Bathinda</td>
<td>i) Goniana Khurd</td>
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<td>ii) Khemuana</td>
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Stage IV: Selection of Cultivator Households

All the cultivator households of these 12 villages were enlisted with the help of nambardar/sarpanch. The list was set in ascending order of their operational area, cumulative frequency was obtained and distribution transformed to arrive at three different groups of farm sizes (small, medium and large farms). The small farm size obtained at was below 2 hectares (ha), medium size between 2-4 ha and large size was above 4 ha. Women respondents (married) from these farm size groups and landless households were enlisted. The household sample included 25 randomly selected households per village making a total sample of 300 from three sample districts selected from the three soil regions of Punjab. These sample households were selected based on their proportion to the total number of households. Table 3.3 gives detail of the sample of the study area.
### Table 3.3: Detail of the Study Area

<table>
<thead>
<tr>
<th>Natural Zones</th>
<th>Central Punjab</th>
<th>Eastern Punjab</th>
<th>South-Western Punjab</th>
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<tbody>
<tr>
<td></td>
<td>Amritsar</td>
<td>Hoshiarpur</td>
<td>Bathinda</td>
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</tbody>
</table>

S.F – Small Farms (< 2 ha), M.F – Medium Farms (2-4 ha) and L.F – Large Farms (> 4 ha)
3.3 **Collection of Data**

Primary and secondary data were collected to achieve the objectives of the study.

3.3.1 **Primary Data**

Primary data relating to various parameters of socio-economic status and components of livelihood security indices were collected from selected households on pretested schedule.

For investigating profile of respondents’ socio-economic status and their participation in various activities, interview schedule contained following information to be collected for the following parameters:

1. Demographic profile of the respondents: household size, sex composition of children, age, education, husband’s education, number of children, type of family, marital status, marital duration, caste etc.

2. Employment pattern and income derived from various sources, assets, and ownership of resources.


4. Participation in household decision making by the respondents on various social and economic matters.

5. Participation of respondents in dairy, crop production, non-farm, off-farm and other activities of women empowerment by time use method.

For measurement of livelihood security indices, schedule contained detailed information to be collected for various indicators of food, health, habitat, economic, social network and educational.

(i) **Food Security Index:** For estimating food security index, detailed information on calorie intake and number of food groups consumed was collected.

(ii) **Health Security Index:** Details on availability and accessibility of primary health centres, hospitals, visit of female health workers, water and sanitation were collected to assess health security.
(iii) **Habitat Security Index**: Habitat security index included comprehensive detailed information on respondent’s habitat, number of rooms, condition of roof, walls, floor, availability and accessibility of water, street condition and mobility.

(iv) **Economic Security Index**: Details on women’s income, savings, productive, unproductive assets and ownership of fixed assets were collected to assess economic security.

(v) **Social Network Security**: Participation of respondent in social network organizations, her role in participation etc were recorded for estimation of social participation.

(vi) **Educational Security Index**: Details on availability and accessibility of primary, secondary education and her literacy level were collected to assess educational security of rural women.

3.3.2 **Secondary Data**

Secondary information was collected from various block development offices, agricultural offices, sarpanches, nambardar and other progressive farmers about local conditions of education, health, habitat, social organization etc. In addition, secondary data were collected from various issues of Statistical Abstract of Punjab and India, Economic Surveys issued by Economic advisor to the Punjab Government, related literature and government reports, records and researches which were hitherto conducted on gender issues.

3.4 **Methods of Analysis**

For analyses of the sample data, different research methods were used. For examining socio-economic profile of the sample respondents and their participation in various activities, simple tabulation technique was used to work out simple averages, ratios, percentages and indices.

3.4.1 **Construction of Indices**

Different indices were worked out to explore the socio-economic status of respondents for the purpose of the study.
3.4.1.1 Educational Disparity Index (EDI)

\[ \text{EDI} = \frac{F_{ed}}{M_{ed}} \]

Where;

\( F \) = Per cent of literate females
\( M \) = Per cent of literate males

If \( \text{EDI} = 1 \); no gender disparity

If \( \text{EDI} < 1 \); there is disparity among males and females in availing and accessing education viz. females are less literate than men

3.4.1.2 Decision Making Index (DECIND)

In the study, twelve areas of women involvement in decision making were considered for two broad household economic and social decision matters:

a) **Economic Related Decisions:**
1. Major financial investment
2. Expenditure on consumer goods
3. Day to day expenditure
4. Expenditure on personal needs
5. Buying and selling of gold
6. Decision to save and
7. Decision to borrow

b) **Social Related Decisions**
1. Personal health care
2. Children matters
3. Visit to her family and friends
4. What to cook and
5. Whom to vote
A husband, wife or both can take decisions. If the decision making is by the wife or by both husband and wife, the woman can be considered to be involved in decision making. Higher weightage of 1 was allocated if the respondent made the decision independently i.e. by herself; 0.5 was assigned if she participated in decision making with her husband; 0 (zero) score was allocated if the respondent did not participate in any decision. A composite or decision index (DECIND) was worked out summing up values for 12 decisions which ranged from 0 if respondents did not involve in any decision and 12 if she took all 12 decision by herself. (Meitei, 2004; Shyamalie and Saini, 2011)

Decisions were classified as:

1. Low if DECIND < 4
2. Medium if DECIND is between 4 - 8.
3. High if DECIND > 8.

3.4.1.3 Livelihood Security Index (LSI)

For estimating livelihood security index of rural women, components of livelihood security index were grouped into six security areas viz. food, health, habitat, economic, social and educational security. To assess these components, indicators were selected from Standard Menu of Indicators for Different Livelihood Securities by CARE (Centre for Assistance and Relief Everywhere), USA (2002).

Each of the indicators was worked out for availability, accessibility quality and status on a 5 point ordinal (likert) scale whose score ranges were pre-calibrated according to local norms and requirements.

Weighted average scores were calculated by scoring various indicators in order of their beneficence/merit on a five point ordinal scale (Likert scale) ranging from 1 to 5 depending upon the importance to each reason. Excellent and well protected securities were ranked 5; good or protected securities scored 4; satisfactory has been allotted 3; not satisfied scores 2 and score 1 indicated poor or serious threat to livelihood security. “Fragile equilibrium of 2.5 i.e. midpoint of continuum shows most needs met but with periods in which some aspects of security were not achieved” (Lindenberg, 2002).
With the help of score, weighted average score index was computed as below:

\[
\text{Livelihood Security Index } i_{1-6} = \frac{1}{fw} \sum_{w=1}^{5} wfw
\]

Where,

i-varies from 1-6 i.e. for all components detailed above. (Refer: Annexure 1)

w-score varies from 1-5.

fw-number of respondents who attached weights ‘w’ to the importance to each reason.

**Standardisation of Scores:** To compare the scores of the respondents in terms of their vulnerability, whether livelihood was secured or not secured for different livelihood outcomes along various districts and farm categories, raw scores were transformed to standard scores. The standard score(\(z\)) is based on normal distribution curve and is formed from deviation scores. A deviation score is formed by finding difference between any one score and the mean(\(X-M\)). The deviation score when divided by standard deviation for that group of scores transform raw score into \(z\) score

\[
Z = \frac{X - M}{SD}
\]

Where, X-score, M-Mean, SD- Standard deviation

“The standard score Z is the number of standard deviations an observation is above the mean. Thus a positive standard score represent a datum above the mean while a negative score represents datum below the mean” (en,Wikipedia.org/wiki/Standard_score). Percentage of respondents in the \(z\) score of +1.0 and-1.0 will be represented by moderate range, greater than+1 will be high range of the index and less than -1 will be in the lower range.

3.4.2 Logistic Regression Analysis

Binary and multivariate logistic regression techniques are used to identify the factors determining women’s status in household decision making in socio-economic matters. “Linear discriminant and logistic regression (LR) are widely used multivariate statistical methods for analysis of data with categorical outcome variables” (Gujarati, 2012). Both these models can be used to predict the probability of a specified outcome
using defined and available variables. These techniques are used to elucidate the effect of one variable on the outcome while controlling the effects of and interrelationship with other variables.

Logistic Regression analysis requires no assumption regarding the distribution of explanatory data while linear discriminant analysis assumes that explanatory variables are normally distributed. “Socio-economic variables are very often categorical and not interval scale”. The models where dependent variable is categorical, multiple linear regression cannot be used as it is based on the assumption that dependent variable should be continuous or interval scale. Hence LR is similar to multiple linear regression but is taken into account when the dependent variable is categorical. Independent variables can be interval scale or categorical; if categorical they should be dummy or indicator coded. “When there is proportion as a response, logistic or logit transformation is used to link the dependent variable to a set of explanatory variables” (Tranmer and Eliot, 2008).

“Meaning of LR is not as straight forward as that of linear regression coefficient. While coefficient B is convenient for testing the usefulness of predictors, Exponential (B) is easier to interpret. It represents the ratio change in the odds of the event of interest for a one unit change in the predictors” (Ibid).

“Dummy variables are used when an explanatory variable is categorical to contrast various categories. There is need to choose a baseline category and create two or more dummy variables. In LR, for each variable, in the present case first category has been taken as the reference category or baseline category and contrast has been made of all remaining categories with the base line. “If explanatory variable has k categories, k-1 dummy variables are required to work out the differences in the categories with respect to the dependent variable” (Ibid).

“Exponential (B) gives relative odds or odd ratios for a particular explanatory variable given other explanatory variables in the model. If the Confidence Interval for Exponential (B) is .93 to 1.23, it indicates that women are between .93 and 1.23 times as likely to take decision i.e. the range has a lower limit of slightly less than the base
category and upper limit of slightly more than the reference category. When exponential \( B = 1 \), it means equal likely to take decisions, if \( > 1 \) means more likely to take decision and if \( < 1 \) means less likely to take decision than the reference category (I.bid).

The respondents were provided with the schedule which asked about 12 areas of women’s autonomy in decision making in economic and social decisions (Refer DECIND)

The schedule had questions with three responses: (1) respondent alone (2) respondent and husband (3) husband and others. In order to create a binary variable, the first and second responses were grouped (in which she has some power) as yes (1) and response III (in which she has no say in the decision) as no (0). The socio-economic status variables obtained from the data are age, work status, marital status, marital duration, number of children, education of the respondent, education of the spouse, husband’s status, family type, community participation, control over income, women’s income and women’s savings, landownership and region (district).

Analysis has been conducted using SPSS version 18.0. The association between predictive (socio-economic status) factors and 12 decision outcome measures of women’s decision making were first analysed using cross tabulations. Bivariate logistic regression was examined to assess significance of level of association of decision outcomes with socio-economic factors. Factors found to be significantly associated (p<.05) with outcome measures in bivariate analysis were put to test in Multivariate Analysis to generate odd ratios in order to identify variables which affect respondent’s status in various socio-economic decision matters. In order to check collinearity between explanatory variables, the Person’s correlation coefficient(r) was tested for p-significance. “Backward stepwise method (BSTEP) is used in multivariable logistic regression to determine the relative independent factors as predictors of women’s autonomy in decision making” (Acharya et al., 2010). BSTEP regression starts with model that includes all predictive factors. It then removes the least significant covariate i.e. the one with the highest p-value at each step until all the predictors are significant.
The Logit Model

The study deals with dichotomous outcome of the dependent variable(Y). The outcomes are woman respondent taking household decision (Y=1) or otherwise(Y=0). The logit model has been estimated as given below:

Specified model is:

If \( P_i \) is the probability that a woman takes decision, the logit model considers the following relationship:

\[
P_i = E(Y = 1 / X_i) = 1/1 + e^{-Z_i} \quad (1)
\]

Where \( Z_i = \beta_0 + \beta_1 X_{i1} + \cdots + \beta_k X_{ik} \)

\( = n(1) \) is known as the (cumulative) logistic distribution function

So, \( 1 - P_i \) = probability of a woman not taking decision = \( 1 - e^{-Z_i} \)

Therefore, \( \frac{P_i}{1 - P_i} \) represents the odds ratio in favour of the incidence viz ratio of the probability that woman takes decision to the probability that she does not take decision.

Now, \( L_i = \log \left( \frac{P_i}{1 - P_i} \right) = Z_i + \beta_0 + \sum_{i=1}^{k} \beta_i X_i \)

Specified logit model used to predict the odds of a woman taking various socio-economic household decisions in sample districts is:

\[
L_i = \log \left( \frac{P_i}{1 - P_i} \right)
\]

\( = \alpha_0 + \beta_1 X_1 \text{ (age)} + \beta_2 X_2 \text{ (m.status)} + \beta_3 X_3 \text{ (edu.)} + \beta_4 X_4 \text{ (n.children)} + \beta_5 X_5 \text{ (m dur)} + \beta_6 X_6 \text{ (f.type)} + \beta_7 X_7 \text{ (h.edu)} + \beta_8 X_8 \text{ (w.s)} + \beta_9 X_9 \text{ (c.o.inc)} + \beta_{10} X_{10} \text{ (h. status)} + \beta_{11} X_{11} \text{ (com part)} + \beta_{12} X_{12} \text{ (l.own)} + \beta_{13} X_{13} \text{ (w. inc)} + \beta_{14} X_{14} \text{ (w.sav)} + \beta_{15} X_{15} \text{ (caste)} + \beta_{16} X_{16} \text{ (dist.)}
\]
As \( L_i = \log \left( \frac{P_i}{1-P_i} \right) \)

Therefore antilog \( L_i = \frac{P_i}{1-P_i} \)

Interpretation in terms of odds is obtained by taking antilog of the various slope coefficients.

The explanatory variables for the logit model for the sample cases are as explained in the following text:

\( X_1 = \text{Age (years)} \)
- 1 – <35 years
- 2 – > 35 years

\( X_2 = \text{Marital Status} \)
- 1 – Married
- 2 – Single(Widow/Divorced)

\( X_3 = \text{Education level of women} \)
- 0 – illiterate
- 1 – primary
- 2 – middle
- 3 – high
- 4 – senior secondary
- 5 – College / Univ.

\( X_4 = \text{Number of children} \)
- 1 – < 3 children
- 2 – > than 3

\( X_5 = \text{Marital Duration} \)
- 1 - < 5 years
2 - >5 years

$X_6$ – Family Type

1 – nuclear family
2 – joint family

$X_7$ – Husband’s education level

0 – Illiterate
1 – primary
2 – middle
3 – high
4 – senior secondary
5 – college/university

$X_8$ – Work status

0 – Not employed
1 – Employed

$X_9$ – Control over household income

0 – No control
1 – Partial Control
2 – Full Control

$X_{10}$ – Husband’s status

1 – Farmer
2 – Business
3 – Service
4 – Wage earners
5 – Politician

$X_{11}$ – Community Participation
0 – Not a member of any organization
1 – Member of an organization

$X_{12}$ – Land ownership
1 – If women is owner of land/house
0 – Otherwise

$X_{13}$ – Women’s Income:
0- Nil
1- Up to Rs 15,000
2- Rs 15,000-30,000
3- Above Rs 30,000

$X_{14}$ – Women saving:
0- Nil
1- Up to Rs 15,000
2- Rs 15,000 – 30,000
3- Above Rs 30,000

$X_{15}$ – Caste
1- Forward or upper caste
2- Backward caste
3- Scheduled caste

$X_{16}$ – District:
1- Amritsar
2- Hoshiarpur
3- Bathinda

$\mu$- Random Error Term

$B_0$ – Intercept term

$B_1$ – $B_{16}$ – Regression Coefficients
3.4.2.1 Description of the Variables and Hypothesis Thereof

Our main objective is to explore the relationship between women’s socio-economic status and autonomy in household decision making. Household decision making is expected to be associated with range of socio-economic characteristics.

\textbf{X}_1 – \textbf{Age}

The respondents in this study with varying ages have been put in under the category 1 if age is < 35 years and 2 if the age of the respondents is > 35 years. Age is a very important factor in household decision making. It is hypothesized that this variable bears a positive sign as it is expected that in our society, women’s status in the household increases with age, i.e. age of the respondent increases her power of decision making. Category 1 (less than 35 years) is taken as reference or base line category to determine odd ratios in logistic regression models.

\textbf{X}_2 – \textbf{Marital Status}

Marital status indicates whether the respondent is married or single (widowed or divorced). Married women’s decision making is hypothesized to be less than the single women who might be associated with greater economic autonomy as they are not constrained seeking their partners consent or agreement in household decisions. Married category (1) is the reference category for determining odds.

\textbf{X}_3 – \textbf{Educational Level of the Respondents}

Tendency to take household decisions increases with increase in the level of education as level of confidence and awareness increases with it. Education is positively associated with women’s empowerment and participation in household decision making. Hence the expected sign of the relationship between education and dependent variable is positive. Illiterate category (1) has been put up as reference in odd ratios.

\textbf{X}_4 – \textbf{Number of Children}

It is expected that responsibilities of a woman increases with more number of children as such decision making increases with more number of children at household level. So it is hypothesized that the expected sign in LR model is positive. Category of less than three children (1) is taken as a reference category in LR models.
\textbf{X}_5 – \textit{Marital Duration} \\

Women of longer duration marriage can participate more in household decision making as compared to shorter duration, so it is hypothesized that \textit{X}7 bears positive relationship with decision making. Shorter duration category (1) is the reference category for computation of odd ratios.

\textbf{X}_6 – \textit{Type of Family} \\

Women in the nuclear family set-up are independent in taking decisions as against those of joint set-up where women autonomy is expected to be less as it is more in the elders’ hands or the head of the family. So it is hypothesized that the sign in LR model is negative i.e. women in joint set—up have less autonomy. Nuclear family category (1) is taken as a reference category in LR models.

\textbf{X}_7 – \textit{Husband’s Qualifications} \\

An educated husband is expected to be sensitive to his spouse’s needs, rights and duties. Education can bring behavioral change in the form of good adjustments and as a result educated spouses can increase women’s autonomy in household decision making. Expected sign in LR of this variable is positive. Illiterate category (1) becomes the reference category for determining odds in LR models.

\textbf{X}_8 – \textit{Work Status} \\

Women’s employment is positively related to their status cross culturally i.e the decision making of a woman increases with her work status. She becomes more independent, aware of her outside world, better informed and as she earns, her status increases and so does her decision making at home. So, the variable is expected to have positive relationship in the model. Not employed category (1) is the reference category for LR models.

\textbf{X}_9 – \textit{Control of Income} \\

A person who has access or control over income can influence decision making at household level to a great extent. So is is hypothesized that \textit{X}8 bears positive relationship with decision making. No control on household income (1) is the reference category for LR models.
X_{10} – Husband’s Status

Husband’s status can influence decision making considerably in a positive and a negative way. Husband’s status in our study can be a farmer, a businessman, in service, wage earner or a politician. The respondent in this study as farmer spouse has been put under the category = 1 and subsequently other dummy variables are assigned. Expected sign in LR of this variable is hypothesized to be negative for businessman, positive for in service spouse and wage earners. Farmer category is the reference category to determine odd ratios.

X_{11} – Community of Social Participation

Women who are participants of community organizations are expected to involve in household decision making. Women participating in these organizations are more informed and well aware of the outside world. Expected sign in LR of this variable is positive. Respondents having no community participation (category 1) are the reference category in LR model.

X_{12} – Land Ownership

Woman who has ownership rights in the form of title of land or other assets is expected to give her access to economic resources independently of men. This can increase her and her family’s welfare subsequently and can bring positive effect on her autonomy in decision making.

X_{13} – Women’s Income

Women’s income supplements household income. As income increases due to respondents earnings, economic condition of the household improves and respondent can satisfy her own and children’s need in a better way and hence her decision making improves. Being economically independent, woman tends to improve her own status at home and in society. Hence the expected sign of the relationship between women’s income and dependent variable is positive. Women having no income (1) are the reference category for the model.
$X_{14} – \text{Women’s Savings}$

Women’s savings can also affect their status in a positive way. Woman having savings is more confident, feel economically secured, if old, is looked after well by her children, can deal with personal health, personal needs and other related decisions in a big way. So this variable is expected to play a positive role in household decision making. So the expected sign is positive. Women with no saving (1) are the reference category for LR models.

$X_{15} – \text{Caste}$

Caste to which the respondent belongs can influence her involvement in decision making. The categorization of caste into forward, backward and scheduled caste brings in difference in their perception about status of women, her role in decision making. Forward caste is mainly patriarchal, does not give due status to women in society and expected sign in LR for women’s decision making is negative. Backward caste mindset again is patriarchal, though less than in the previous case. Scheduled caste respondents earn their livelihood and their dependence on their spouses is less compared to forward caste, so their expected effect on women decision making is positive. Forward caste category (1) is taken as a reference category for determining odds in LR models.

$X_{16} – \text{Region/District}$

Amritsar, Hoshiarpur and Bathinda are the sample districts for the study. Amritsar is chosen as a reference category for the model.