CO-OPERATIVE UNIVERSITY, SAGAING
DEPARTMENT OF STATISTICS
MASTER OF APPLIED STATISTICS

FACTORS AFFECTING ON POVERTY OF HOUSEHOLDS IN FLOODED AREA OF SHAN KA LAY KYUN VILLAGE, AMARAPURA TOWNSHIP

EI SHWE SIN

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This thesis is submitted to the Board of Examiners in partial fulfillment of the requirements for the degree of Master of Applied Statistics.

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ACCEPTANCE

This is to certify that this paper entitled **"Factors Affecting on Poverty of Households in Flooded Area of Shan Ka Lay Kyun Village, Amarapura Township"** submitted as a partial fulfillment towards the degree of Master of Applied Statistics has been accepted by Board of Examiners.

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ABSTRACT

This paper is concerned with the socio-economic status and poverty level of households in Shan Ka Lay Kyun Village. The objectives of the study are to investigate the socio-economic situations of households, to analyse the factor affecting on the expenditure of households and to analyze the socio-economic factors affecting on poverty of household in flooded area of Shan Ka Lay Kyun Village, Amarapura Township. Primary data to collect the require information 300 households from 850 households are randomly selected by using simple random sampling method. In this paper, descriptive analysis, multiple regression analysis, binary logistic regression analysis and principal component analysis (PCA) for calculating wealth index are used. Most of the household heads are primary education level. Households' earned monthly income between 90000 and 374999 Kyats. Households' monthly expenditure was found between 22100 and 162099 Kyats. To analyze the factors affecting on monthly expenditure of households, multiple linear regression model is used. According to the results of multiple linear regression models, total income, family size, length of stay and number of students are statistically significant. In binary logistic regression analysis, total income and loans are positively correlated with poverty and occupation, family size, gender and number of student are negatively correlated with poverty. It is suggested that garbage system should be changed for not harming in environment and the socio-economic life of households in Shan Ka Lay Kyun Village should be uplift to increase the income level.

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LIST OF ABBREVIATIONS

CAPM	Capital Asset Pricing Model
DC	District Commissioner
DDEC	District Disaster Emergency Committee
D.f	Degrees of Freedom
EWS	Early Warning System
FAO	Food and Agriculture Organization
FEI	Food Energy Intake
FPL	Food Poverty Line
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
H-L Tests	Hosmer and Lemeshow Tests
IFVI	Integrated Flood Vulnerability Index
IWI	International Wealth Index
KMD	Kenya Meteorological Department
KMO	Kaiser-Meyer-Olkin Measure
LAC	Latin American Countries
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PCA	Principal Component Analysis
PMG	Pooled Mean Group
Q.Q Plot	Quantile-Quantile Plot
RC	Reinforced Concrete
SEA	South and East Asia
Sig.	Significance
SMCA	Spatial Multi Criteria Analysis
SPSS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
SYS-GMM	System Generalized Method of Moment
TV	Television
UNDP	United Nations Development Program
USD	United States Dollar

VCD	Versatile Compact Disc
2SLS	Two Stage Least Square

CHAPTER 1

INTRODUCTION

Poverty is the state of not having enough material possessions or income for a person's basic needs. Poverty may include social, economic, and political elements. Absolute poverty measures compare income against the amount needed to meet basic personal needs, such as food, clothing, and shelter. Relative poverty measures when a person cannot meet a minimum level of living standards, compared to others in the same time and place. Therefore, the floor at which relative poverty is defined varies from one country to other, and also from one society to other.

In the United Nations, poverty is the inability of having choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It also means not having enough to feed and clothe a family, not having a school or clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities and it often implies living in marginal or fragile environments, without access to clean water or sanitation.

In World Bank, poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one's life.

The socio-economic impacts refer to all changes in the way people live, work, relate, organize and socio-economic impact interactions have direct influence on means of livelihood, the purchasing and production power, mass migration and agriculture. More specifically, social impacts concern poverty, loss of life, health effects, loss of community cohesion, loss of time, changing attitudes, impoverish neighborhood etc., which are difficult to quantify in monetary terms.

The economic impacts include disruptions of clean water and electricity supply, transport, communication, education, health care services, reduction in purchasing power and loss of land value in the flood plains which can lead to increased vulnerabilities of communities in the living area. The additional cost of

rehabilitation, relocation of flood victims and removal of property from flood-affected areas can divert the capital required for maintaining production.

Socio-economic impact of flood included the loss of and destruction of properties and life, which may eventually last for a short or long term. Flood losses reduce the assets of households, communities and societies through the destruction of standing crops, dwellings, infrastructure, buildings, and machinery. Economic losses due to the effects of damaging floods have increased significantly around the world (Integrated Flood Risk Management in Asia, 2005).

1.1 Rationale of the Study

In south-east Asia, including Myanmar, the frequency of floods is predicted to increase with climate change. This would exacerbate the situation of poor people living in flood-prone areas. Studies have shown that poor people often live in risky environments, such as on floodplains or in urban areas at high risk of flood. There are relationship between poverty and natural disasters, while some studies have considered how climate change will affect poverty in certain countries.

Economically, poor people are the most vulnerable to the effects of floods and other natural disasters. The impact of such disasters differs greatly across regions and countries, little is known about the relationship between floods and poverty at the local level.

Global poverty is defined as the number of people worldwide who live on less than $1.90 a day. A person surviving on less than $1.90 a day lives in extreme poverty, as defined by the World Bank. More than 736 million people or one out of every ten people on the planet currently live below this poverty threshold, and children, a highly vulnerable segment of society, account for more than half of the world's poorest citizens.

Poverty in Myanmar's rural areas is substantially higher than that in poverty urban areas and 38.8 percent of the rural population is estimated to be poor compared to 14.5 percent of rural population in towns and cities. Poverty remains geographically spread in Myanmar especially in the coastal and mountainous areas, 4 in10 of the population are poor and 1 in 6 will struggle to meet people's basic food needs, while 65 percent of the poor live in the Dry Zone and Delta. Poverty has declined over time, a result consistent with the results of the Part One report released in August 2017.

Poor households are typically characterized as having more family members and more young and elderly dependents per working age adult. Household heads also typically have lower levels of education than the average household, and household heads' working age members also have lower than average education levels.

Poverty and flooding are two social problems that have existed, and coexisted within rural and urban communities. Whilst these two social evils have severely affected development programs in some rural communities, they have also manifested themselves into permanent features through lowering the standard of living in the communities. At times flooding has been found to exacerbate poverty levels and vice versa. However, community resilience and capacity to deal with both poverty and flooding have been found to be lacking in most human societies. In recent times, unprecedented incidents of flooding have resulted in serious disruption of human societies.

Mandalay is an administrative division in central part of Myanmar and lies on the eastern bank of the Ayeyarwady River. The villages in rural area of Amarapura experience flooding from time to time due to Amarapura is proximity to Ayeyarwady River that raises during heavy rains. Shan Ka Lay Kyun is one of the village which flooding from time to time during heavy rains. Therefore, the socio-economic factors affecting on poverty of household in flooded area of Shan Ka Lay Kyun village are analyzed in this paper.

1.2 Objectives of the Study

The specific objectives of the study are:

(i) to investigate the socio-economic situations in Shan Ka Lay Kyun Village, Amarapura Township

(ii) to analyse the factor affecting on the expenditure of households

(iii) to analyze the socio-economic factors affecting on poverty of household in flooded area of Shan Ka Lay Kyun Village, Amarapura Township.

1.3 Method of Study

Primary data to collect the require information 300 households from 850 households are randomly selected by using simple random sampling method. Primary data were randomly collected from the selected households by using structural

questionnaires. Descriptive analysis, multiple regression analysis, principal component analysis using wealth index and binary logistic regression analysis were used in this study.

1.4 Scope and Limitations of the Study

This study focuses the households in Shan Ka Lay Kyun Village in Amarapura Township, Mandalay Region, in January 2021, survey. Among the various statistical models for descriptive analysis, multiple regression analysis, binary logistic regression analysis and principal component analysis (PCA) for calculating wealth index were applied.

1.5 Organization of the Study

This study is organized into five chapters. Chapter 1 is the introduction of this thesis which presents five sub-titles such as rationale of the study, objectives of the study, methods of the study, scope and limitation and organization of the study. Chapter 2 covers literature review which include into theoretical review and empirical review. Chapter 3 presents the methodology. Chapter 4 constitutes analysis of factors affecting the poverty of household in flooded area of Shan Ka Lay Kyun Village, Amarapura Township. Chapter 5 discusses the conclusion based on findings, recommendations and suggestions and needs for further study.

CHAPTER 2
LITERATURE REVIEW

In this chapter, theoretical review and empirical reviews on poverty of households and the socio-economic factors affecting on poverty are conducted.

2.1 Theoretical Review

The theoretical literature review includes definition of poverty, history of poverty, extreme poverty, absolute poverty and relative poverty, multidimensional poverty, measuring of poverty, international poverty line, and cycle of poverty, history of poverty line in Myanmar, food poverty and measurement of food poverty.

2.1.1 Definition of Poverty

The word poverty comes from the old (Norman) French word poverte (Modern French: pauvreté), from Latin paupertās from pauper (poor). There are several definitions of poverty depending on the context of the situation it is placed in, and usually references a state or condition in which a person or community lacks the financial resources and essentials for a certain standard of living.

Poverty is the state of not having enough material possessions or income for a person's basic needs. Poverty may include social, economic, and political elements. Absolute poverty is the complete lack of the means necessary to meet basic personal needs, such as food, clothing, and shelter. The floor at which absolute poverty is defined is always about the same, independent of the person's permanent location or aera. On the other hand, relative poverty occurs when a person cannot meet a minimum level of living standards, compared to others in the same time and place. Therefore, the floor at which relative poverty is defined varies from one country to another, from one society to another.

Many governments and non-governmental organizations try to reduce poverty by providing basic needs to people who are unable to earn a sufficient income. The efforts can be hampered by constraints on government's ability to deliver services, such as corruption, tax avoidance, debt and loan conditionality's and by the brain drain of health care and educational professionals. Strategies of increasing income to make basic needs more affordable typically include welfare, economic freedoms and providing financial services. Meanwhile, the poorest citizens of middle-income

countries have largely failed to receive an adequate share of middle-income countries' increased wealth.

Poverty is a state or condition in which a person or community lacks the financial resources and essentials for a minimum standard of living. Poverty means that the income level from employment is so low that basic human needs can't be met. Poverty-stricken people and families might go without proper housing, clean water, healthy food, and medical attention. Each nation may have poverty-stricken own threshold that determines how many of nation's people are living in poverty.

2.1.2 History of Poverty

Poverty is often discussed in terms of dollar amounts; quality of life is also part of the conversation. Living in poverty means a life of struggle and deprivation.

Children living in poverty often lack access to quality education. Children living in poverty are not enough quality schools, children's parents cannot afford school fees, or because impoverished families need parent's children to work. Without a quality education, children grow up being unable to provide for parent's own children with the generational cycle of poverty.

Living in poverty also means not being able to afford a doctor or medical treatment. It means no electricity, limited shelter, and often little to no food on the table. For young children, improper nutrition can mean stunting and wasting that permanently impact children's development. In impoverished countries where many people lack access to clean water and sanitation, poverty means the spread of preventable diseases and the unnecessary death of children.

Historically, poverty has been calculated based on a person's income and how much he or she can buy with that income, but new multidimensional measures are more holistic.

Recent estimates for global poverty are that 9.2 percent of the world, or 689 million people, live in extreme poverty on $1.90 or less a day, according to the World Bank. In the United States, 11.8 percent of the population or 38.1 million people, live in poverty with an income of less than $33.26 per day according to the 2018 census.

Numbers are calculated based on income and a person's ability to meet basic needs. However, when looking beyond income to people experiencing deprivation in health, education, and living standards, 1.3 billion people in 107 developing countries

are multidimensionally poor, according to a 2020 report by the U.N. Development Program (UNDP).

A poverty line, also called a poverty threshold, is the line below which it is difficult, if not impossible, to afford basic needs. The poverty line is determined in each country by adding up the cost of meeting minimum needs, such as food and shelter. Household incomes that are too low to afford minimum needs, such as food and shelter, are below the poverty line.

The income necessary to afford meeting minimum needs typically sets the poverty line for a country. Poverty lines can then be compared between countries. The international poverty line is the standard poverty line for measuring poverty globally. However, relatively new measures such as the Global Multidimensional Poverty Index include measurements of health, education, and living standards, all as signs of poverty.

Poverty lines are not the same in all countries. In higher-income countries, the cost of living is higher and so the poverty line is higher, too. In 2017, the World Bank announced new median poverty lines, grouping countries into low-income, middle-income, and high-income countries and finding the median poverty line for high-income countries groups are;

(i) $1.91 per person per day in 33 low-income countries
(ii) $3.21 per person per day in 32 lower-middle-income countries, such as India and the Philippines
(iii) $5.48 per person per day in 32 upper-middle-income countries, such as Brazil and South Africa
(iv) $21.70 per person per day in 29 high-income countries

The root causes of poverty are not only a lack of access to basic necessities of life like water, food, shelter, education, or healthcare. Inequities including gender or ethnic discrimination, poor governance, conflict, exploitation, and domestic violence also cause poverty. The inequities not only lead a person or a society into poverty but can also restrict access to social services that could help people overcome poverty.

The places most entrenched in poverty are fragile contexts, which can be entire countries or areas of a country. In fragile states, children and communities face higher rates of poverty due to political upheaval, past or present conflict, corrupt leaders, and poor infrastructure that limits access to education, clean water, healthcare, and other necessities.

2.1.3 Extreme Poverty

Since 2015, the World Bank has defined extreme poverty as people living on $1.90 or less a day, measured using the international poverty line. But extreme poverty is not only about low income; it is also about what people can or cannot afford. Extreme poverty is identified in two ways: absolute poverty and relative poverty.

2.1.4 Absolute Poverty and Relative Poverty

Absolute poverty is when a person cannot afford the minimum nutrition, clothing, or shelter needs in people's country.

Relative poverty is a household income below a certain percentage, typically 50 percent or 60 percent, of the median income of that country. Relative poverty measurement takes into consideration the subjective cost of participating in everyday life. For example, plumbing is a necessity in some places; without plumbing, a person could be considered impoverished. But, in other places plumbing is a luxury. Relative poverty is useful for considering income inequality within a country.

2.1.5 Multidimensional Poverty

Multidimensional poverty acknowledges that poverty isn't always about income. Sometimes a person's income might be above the poverty line, but family's has no electricity, no access to a proper toilet, no clean drinking water, and no one in the family has completed six years of school.

The Global Multidimensional Poverty Index looks beyond income to measure a person's healthcare, education, and living standards to determine poverty levels. The Global Multidimensional Poverty Index as developed in 2010 by the U.N. Development Program (UNDP) and the Oxford Poverty and Human Development Initiative.

Within the categories of health, education, and living standards, there are 10 key indicators of multidimensional poverty that include nutrition, child mortality, years of schooling, school attendance, cooking fuel, sanitation, drinking water, electricity, housing, and assets. If a person is experiencing deprivation in three or more of the person standards, then he or she is multidimensionally poor.

The Global Multidimensional Poverty Index offers a thorough look at poverty and can provide guidance for the specific interventions necessary in each country to eliminate poverty.

2.1.6 Measuring of Poverty

Poverty is measured by each country's government, which gathers data through household surveys of country's government own population. Entities like the World Bank provide support and may conduct country's government own surveys, but this data collection is time-consuming and slow. New forms of high-frequency surveys using estimates and mobile phone technology are being developed and tested.

2.1.7 International Poverty Line

The international poverty line, currently set at $1.90 a day, is the universal standard for measuring global poverty. International poverty line helps measure the number of people living in extreme poverty and helps compare poverty levels between countries.

As the cost of living increases, poverty lines increase too. Since 1990, the international poverty line rose from $1 a day, to $1.25 a day, and most recently in 2015 to $1.90. This means that $1.90 is necessary to buy what $1 could in 1990.

In addition to the lowest-income poverty line at $1.90, the World Bank also reports poverty rates using two new international poverty lines: a lower middle-income line set at $3.20 per day and an upper middle-income line at $5.50 a day.

2.1.8 The Cycle of Poverty

If someone to get out of poverty, who need opportunities such as education, clean water, medical facilities nearby, and financial resources. Poverty becomes a cycle from one generation to the next.

If families are too poor to send the children to school, the children will have a difficult time earning an income when growing up. If a community lacks clean water, women will spend much of the day of fetching water instead of earning an income. If medical facilities are far away, a parent loses income every time by taking take a sick child to the doctor.

Natural disasters and conflict can add to the cycle of poverty or add people to it. When a natural disaster strikes an impoverished community without functional

public institutions, families are more vulnerable and often lack basic resources to recover, the further entrenching a community in poverty or jeopardizing one that had recently emerged.

2.1.9 History of Poverty Line in Myanmar

The proportion of the population living in poverty declined substantially between 2005 and 2017. Median daily expenditures per adult equivalent increased since 2005, resulting in significant poverty reduction. The proportion of the population living below the poverty line declined from 48.2 percent in 2005 to 24.8 percent in 2017. Despite population growth, the number of poor people declined from 18.7 million in 2005 to 11.8 million in 2017. A decrease of 23.4 percent points in the poverty headcount since 2005 reflects the strong economic growth that Myanmar has seen since the economic and political transition: between 2005 and 2017, Myanmar's annual growth rate in GDP per capita was 7.8 percent with the highest among Southeast Asian countries. Changes in the depth and severity of poverty follow similar patterns to changes in depth and severity observed for the poverty headcount. On average, the poor have seen an increase in welfare in the survey years from 2005 to 2017, and the annual increase has been fastest between 2015 and 2017.

Poverty has become increasingly concentrated in rural areas. The share of the poor residing in rural areas has increased from 82.6 percent in 2005 to 87.0 percent in 2017. Poverty remains high and concentrated in rural areas, allowing more space for poverty reduction in rural areas. In contrast, in urban areas, the poverty headcount is low, making a further reduction of poverty in the urban areas comparatively difficult.

Poverty is more prevalent in rural areas. The poverty headcount is significantly higher in rural areas of Myanmar with 30.2 percent than in urban areas with 11.3 percent. The number of poor people is also 6.7 times higher in rural areas than urban areas, and number of poor people residing in rural areas make up an overwhelming majority with87 percent of the nation's poor.

In 2017, the national poverty line in Myanmar is 1,590 kyat per adult equivalent per day. The poverty line defines the minimum welfare level that is necessary for a person not to be considered severely deprived. In this report, minimum need is benchmarked using calorie needs. A household is considered to be poor if household's per adult equivalent consumption level in kyats falls below the threshold that is considered necessary to meet the basic minimum standard of living in

Myanmar. An individual in Myanmar is considered to be poor if people live in a household with consumption per adult equivalent per day of 1,590 kyat or less. A quarter of the population of Myanmar is considered poor. 24.8 percent of the Myanmar population is poor, which corresponds to nearly 11.8 million people.

2.1.10 Food Poverty and Measurement of Food Poverty

Food poverty is lacking the means to obtain enough food to live a healthy life. People living in food poverty have an income or expenditure that is less than the amount needed to consistently afford a basket of food with minimum recommended nutritional intake. The cost of this basket is called a food poverty line (FPL) with people living below the FPL are not able to afford the cost of food necessary for good health and are in danger of malnutrition, disease or ill health.

The monetary value of an FPL is most often based on the cost of affording a minimum energy intake using locally available goods. This is known as the food energy intake (FEI) method. A global standard for the threshold of food poverty is 2,100kcal per adult per day, which is the Food and Agriculture Organization's (FAO) recommended daily energy intake to enable an adult to live a healthy and moderately active life.

As the cost of non-food essentials is not included, the FPL is often considered the most extreme measurement of monetary deprivation. Higher poverty measures, such as national poverty lines, consider the cost of a combination of both food and non-food essentials which are housing, clothing, education and access to water, sanitation and electricity, etc. People living in food poverty are forced to priorities between food and non-food essentials on a daily basis.

Food poverty is measured using data from national household surveys which capture household income and/or expenditure data. If a household's average per person income or expenditure is less than the food poverty line (FPL), all individuals in the household are considered to be in food poverty.

FPLs themselves are created from household surveys which measure food consumption patterns and the prices of local foodstuffs. Food poverty lines are then set by national statistical offices, by reflect the local cost of food. Food poverty lines may be created for subnational regions, reflecting different prices or consumption patterns of food. Many economies use differing thresholds of food poverty in urban and rural areas.

2.2 Empirical Review

Awopetu, et al. (2016) studied "The Impact of Flood on the Socio-economic Status of Residents of Wadata and Gado-villa Communities in the Makurdi Metropolitan Area of Benue State, Nigeria". The study examined the effect of flood on the socio-economic status of residents of Wadata and Gado-villa communities in the Makurdi metropolitan area of Benue State, Nigeria. The study used quantitative approach, purposive sampling and demographic variables. This paper found that flood impacted negatively on the socio-economic well-being of residents in the two communities.

Cuddy, et.al (2008) studied "Factors Influencing Poverty Levels in Rural Households in Southwest China". The objective of the study is to examine factors behind poverty in Kelang and Haizi, rural villages in Yunnan province in the South West China. Determinants of household income per capita, off-farm employment choice and off-farm income levels were explored using seemingly unrelated regression, probit model and Heckman selection model, respectively. In 2003, the data was collected from Farm household's survey data. In this study, the results show land productivity, days worked off-farm and proximity to a large city are highly significant in raising household income per capita. Area farmed per labour unit, and the higher education level, are also significant. The more interesting significant factors influencing the decisions to work off farm are land productivity (negative), the number of household labour units working off-farm (positive), the age of the worker (negative) and the income level of households (positive). So, off-farm employment, land productivity, land area per labour units, and education are played an important role in determining the level of household income per capita in rural households in Southwest China.

Ranathunga, et.al (2015) analyzed "The Factors Determine Household-Poverty in the Estate Sector in Sri Lanka". The objective of the study is to explore the micro-level factors relate with poverty levels and changes in the estate sector in Sri Lanka from the period 1990 to 2010 by probit regression analyses. The data used secondary data and obtained from Disaggregated Household Income and Expenditure Survey data. In this study, the results indicate that the major determinants of escaping poverty are the household head being employed in public sector, the head engaging in the non-agriculture sector, the spouse being employed in public sector, and the higher female adult ratio of the household, and the receipt of remittance. The results are

statistically significant variables to the model. Households with the higher dependency ratio, the large household size and the female headed households are more likely to be poor in the estate sector in Sri Lanka. Both positive and negative factors show declining trends of the impact on poverty over time. Remittance plays a very important role in poverty reduction in Sri Lanka as a whole and especially in the estate sector in 2010.

Khan, et.al (2015) explored "Determinants of Rural Household Poverty: The Role of Household Socioeconomic Empowerment". The objective of the study is to investigate the factors affecting rural household poverty in district Bahawalpur, Pakistan by using primary data collected through rural household survey. Through multistage random sampling technique 600 households from two tehsils of district Bahawalpur are selected for data collection. Socioeconomic empowerment index is produced by using principle component analysis to use it as a proxy of socioeconomic empowerment of the household. The results indicate the socioeconomic empowerment, only agriculture occupation, experience of the household in agriculture, remittances, female to male ratio, employment ratio, household size and sewerage system have significant impact on rural household poverty.

Rayhan (2010) studied "Assessing Poverty, Risk and Vulnerability: A Study on Flooded Households in Rural Bangladesh". This study aimed to examine the poverty, risk and vulnerability for flood hazards. This research used three-stage stratified random sampling technique and cross-sectional household survey. A utilitarian approach was used to assess flood vulnerability and the components. A set of households' characteristics and shock (flood) variables were used as explanatory variables. The results showed that poverty and idiosyncratic flood risks are positively correlated and highly significant.

Agyemang (2014) explored "Economic Growth, Income Inequality and Poverty Reduction: A Regional Comparative Analysis". This study examines and compares the implications of economic growth on poverty and income inequality among 76 countries across sub-Saharan Africa (SSA), South and East Asia (SEA), Latin American countries (LAC) and the OECD region for the period 1990 to 2010. The results using SYS-GMM estimator leads to some interesting findings. This paper was used the econometric models that have used to investigate the relationship between economic growth, income inequality and poverty, and discuss some of the econometric challenges associated with the model and how to address the

econometric challenges. This study find that economic growth has led to reduction in both income and human poverty levies in all developing regions. The findings are also economic growth translates into little poverty reduction in all the regions when income inequality is high than when it is low.

Younus, et al. (2014) studied "Economic consequences of failed autonomous adaptation to extreme floods: A case study from Bangladesh". This paper has one aim: to assess the economic consequences of failure effects of autonomous adaptation in response to extreme flood events. The methodology used in this research includes a 'multi-method' approach which consists of structured questionnaire surveys, two Participatory Rapid Appraisals and agriculture block supervisors' interview – all were conducted in 2006. The method follows a case study approach, with a random systematic sampling of questionnaires. The study found that Bangladeshi farmers are highly resilient to extreme flood events, but the economic consequences of failure effects of autonomous crop adaptation on marginal farmers are large. The failure effects are defined as total input costs plus the small profit (otherwise) made from selling the small surplus remaining from subsistence needs.

Sardar, et al. (2016) interpreted "Natural Disasters and Economic Growth in Pakistan: An Enquiry into the Floods Related Hazards' Triad". This study explores three floods related hazards: mortality, damage to property and non-fatal effect on the population. This study uses two stage least square (2SLS) estimation technique to analyze the determinants of the magnitude of floods related hazards and 2SLS impact on per capita GDP growth of Pakistan. Lastly, misspecification test of residual analysis for model's validation and instruments exogeneity are reported in Section 4.3. This study finds that GDP growth per capita, floods frequency, population density, infrastructure and institutions of disaster management are important determinants of the magnitude of floods related hazards. In addition, floods related hazards have significant negative impact on GDP per capita growth.

Mahanta, et al., (2017) examined "Flood induced vulnerability to poverty: Evidence from Brahmaputra Valley, Assam, India". This paper attempts to assess household vulnerability to poverty due to flood in Assam. Whether coping measures can reduce vulnerability and what factors affect such coping has also been examined. The results show that incidence of poverty, flood height and use of coping strategies play significant role in determining households' vulnerability to poverty. The study also suggests that institutional factors, household's socio-economic

conditions and community characteristics determine the use of coping strategies at the household level.

Svetlanaa, et al. (2015) studied “The economic impact of floods and their importance in different regions of the world with emphasis on Europe”. The objective of this paper is to economical analyze flood damage in various regions of the world. The paper was developed based on data from secondary sources from the European Environment Agency and the Ministry of Environment of the Slovak republic. One single event may produce both benefits and losses to different parts of the riverine ecosystem and the impact on the economy of the State. This paper was found extremely difficult to quantify or monetize e.g. by quantifying ecosystem services before and after an event or accounting for the number of fish killed or trees damaged. If more people are to dwell in vulnerable areas and more and more businesses settle down in vulnerable areas the more intensive effect a flood event will have upon society and the world economy. Society is becoming more aware that floods can be controlled to a limited extent, and that absolute safety against floods is a myth with which is necessary to fight for the improvement of the world economy.

Mbura (2014) examined “Disaster Management and Persistent Flooding Disaster in Dar Es Salaam”. This research study overall objective was to examine the effects of floods and disasters on the real income of the victims and the economy of the country, assess the social hazards emanating from floods turning into disasters in Dar Es Salaam particularly on infrastructure. The research used descriptive research design where data was collected using questionnaire administration and interview for primary data, reference from library literatures on issues related to the study findings, readings, difference journals and published articles and reports that related to the study finding. The findings that, there is an absence of skilled personnel in disaster management structure, lack of accountability of government officials, poor coordination among the stakeholders at different levels, and weak technical capacity to address disaster risk reduction.

Dube, et al. (2018) explored “Flooding and Poverty: Two Interrelated Social Problems Impacting Rural Development in Tsholotsho District of Matabeleland North Province in Zimbabwe”. The objectives that the study sought to fulfil were to establish the impact of flooding on the development of rural communities, to analyse how poverty manifests itself in rural communities, to analyse the relationship that exists between flooding and poverty and to suggest ways for dealing with the two

problems. This study used the qualitative approach and the interpretive research paradigm. A qualitative research approach, based on interviews and observations, is used to gather data from the research participants. The study finds that flooding impeded development through the shifting of human populations, destruction of crops, shelter and livestock. Floods also affected human capital through causing injuries to members of the community. This study further finds that a strong relationship exists between flooding and poverty because of the fact that flooding causes or worsens poverty, whereas poverty increases vulnerability.

Karina (2014) analyzed "Vulnerable People and Flood Risk Management Policies". The main goal of this research is to evaluate the measures in flood DRM policies for vulnerable people and to make policy recommendations in accordance with the results. The authors used two methods to select indicators: deductive research, which is based on a theoretical understanding of relationships and uses dynamic modeling; and inductive research, which is based on empirical generalizations and uses statistical modeling

Rahman and Saleh studied (2014) examined "Impacts of Flood on The Lives and Livelihoods of People in Bangladesh": The objectives of the study are to assess the situation, the history, the causes, aggravating factors, extent and effects of the flood, to document the hazard and vulnerability, and various capacities of the community; to study the local knowledge, practices and beliefs in the community; to formulate community based plans for flood mitigation and flood disaster risk reduction. The researcher was used cross sectional narrative study, door to door survey, observation and recording technique, pilot study and the qualitative content analysis process. A case study was a village in Manikganj district. The study found that floods have adverse impact on the socio-economic status of livelihoods for people in Gopinathpur Community. The study has established that flood sustainability and depth have a vital role on livelihood patterns.

Tu, et al., (2011) explored "Adaptation to flood risks in Ho Chi Minh City, Vietnam". This paper aims to present part of the research results in developing an adaptation process to cope with flood risk in coastal cities under the impact of climate change variability and rapid urbanization in Ho Chi Minh City, Vietnam. Two main assessment tools applied in this research are rapid vulnerability assessment and tool for environmental assessment and management. The research found that under the same natural conditions, people living in more urbanized districts suffer with more

inundation and risks from polluted floodwater than who live in less urbanized districts. Gender analysis in this research has found that men and women play different roles in coping with hazards, and women suffer with more risks than men especially in term of health, sexual harassment, and increasing responsibility.

Niipare, et al. (2020) examined “Flood Impacts in Oshana Region, Namibia: A Case Study of Cuvelai River Basin”. The main objective was to find ways of mitigating the impacts of flooding in the Oshana region, focusing more on early warning system and strengthening the coping capacity for the region.”. The study relied on the use of primary and secondary data. Primary data were obtained mainly from the result of interviews with key informants at the community level and also visual observations were used to determine the physical vulnerability of the selected community. The study findings revealed that vulnerability to floods is mainly due to lack of resources, poverty, poor infrastructure, limited budget, inactive disaster risk management structures in the region, rapid population change, non-existing Early Warning System (EWS), lack of awareness of the flood impacts, low income, and the fact that many houses are headed by females.

Obiayo, et al. (2016) interpreted “Influence of Floods on Education and Sanitation Sustainability in Nyando River Basin, Nyando Sub-County, Kenya”. The objective of the study was to assess the influence of floods on education status in the communities. Specifically, the study sought to examine the influence of floods on access to water, sanitation and healthcare services in the communities. This study applied the cross-sectional survey design, which allows the collection of requisite information from target population at a single point in time. It involved the application of two approaches, quantitative and qualitative. Three data collection instruments were applied in this study, including a household survey questionnaire, a key informant interview schedule and an observation checklist. The study was founded on the assumption that communities in the low-risk and high-risk zones were similar in terms of socio-economic indicators, such that whatever variations noted after the floods, were exclusively attributed to the floods.

Paul and Routray (2010) studied “Flood proneness and coping strategies: the experiences of two villages in Bangladesh”. This study attempts to explore how people in two flood-prone villages in Bangladesh employ different preventive and mitigative measures through different coping strategies. Primary data were collected through interviews with key informants in Bannabari and Suvagacha, household

surveys and unstructured interviews, as well as via focus group discussions with household members in both villages in this research. This study finds that flooding has disastrous impacts on people's socioeconomic condition as well as on the environment, which depend not only on the magnitude of the event but also on some other variables such as income, lack of awareness, level of education, occupational structure and physical location of the area. The findings confirm the earlier proposition of Haque and Zaman (1993) and Kunii et al. (2002) that the flood problem in Bangladesh is not merely a hydraulic dynamic; rather, it is also linked to issues of demography, ecology, education, settlement pattern, society, socioeconomic status and even culture and politics.

Ambuchi (2011) examined "Flood Disaster Preparedness and Management in Schools, a Case Study of Budalang'i Area in Busia County". The purpose of this research was to find out the level of flood disaster preparedness and management in schools, that is primary and secondary schools, located along river Nzoia, two kilometers from the river banks, in Budalang'i area, Busia County. Specific objectives are to find out the levels of awareness of the early warning systems from relevant authorities, to determine the level of preparedness of schools to respond to flood events, to find out the existing facilities/techniques in schools to combat flood problems and to establish the awareness of flood levels and frequencies. The study used a multi-stage sampling technique where a two-stage sampling design was used. The first stage was to select primary and secondary schools that are located within approximately two kilometers from the banks of river Nzoia. The second stage was to select respondents from the sub groups of principals, teachers, students and pupils. Questionnaires were directed to each category of the respondents to collect primary data. Data analysis was done using Statistical Package for Social Scientists (SPSS). The study found that the level of preparedness for flood disasters management in schools is low. The schools are not members of the District Disaster Emergency Committee (DDEC), hence are not aware of early warning information from Kenya Meteorological Department (KMD), through the District Commissioner (DC), concerning the levels of water in the river.

CHAPTER 3
METHODOLOGY

This chapter provides the analytical methods used for the study on the factors affecting the poverty of households in flooded area of Shan Ka lay Kyun village, Amarapura Township.

3.1 Regression Analysis

Regression is a statistical method used in finance, investing, and other disciplines that attempts to determine the strength and character of the relationship between one dependent variable (usually denoted by Y) and a series of other variables (known as independent variables).

Regression helps investment and financial managers to value assets and understand the relationships between variables, such as commodity prices and the stocks of businesses dealing in commodity price commodities.

The two basic types of regression are simple linear regression and multiple linear regression, although there are non-linear regression methods for more complicated data and analysis. Simple linear regression uses one independent variable to explain or predict the outcome of the dependent variable Y, while multiple linear regression uses two or more independent variables to predict the outcome.

3.2 The Simple Linear Regression Model

Simple random sampling is defined as a sampling technique where every item in the population has an even chance and likelihood of being selected in the sample. Here the selection of items entirely depends on luck or probability, and therefore this sampling technique is also sometimes known as a method of chances.

Simple random sampling is a fundamental sampling method and can easily be a component of a more complex sampling method. The main attribute of this sampling method is that every sample has the same probability of being chosen.

The sample size in this sampling method should ideally be more than a few hundred so that simple random sampling can be applied appropriately. Simple random sampling method is theoretically simple to understand but difficult to implement practically.

Consider the modeling between the dependent and one independent variable. When there is only one independent variable in the linear regression model, the model is generally termed as simple liner regress ion model. Dependent or explained variable is random and other regressor (independent or explanatory variable) and which is not random. The simple linear regression model as defined as

$$Y_i = \beta_{0+}\beta_1 X_{i+}\varepsilon_i \qquad i = 1, 2\ldots n \qquad (3.1)$$

Where, Y_i = dependent variable or response variable for observation i.

X_i = independent variable or explanatory variable for observation i.

β_0 = intercept (or) regression constant

β_1 = slop (or) regression coefficient

ε_i = error term (or) residual

The above equation, which is also called the two variable linear regression model or bivariate linear regression model because it relates the two variables X and Y.

3.2.1 Assumptions of Simple Linear Regression

Simple linear regression is a parametric test, meaning that it makes certain assumptions about the data. The assumptions are:

(i) **Homogeneity of variance (homoscedasticity)**: the size of the error in our prediction doesn't change significantly across the values of the independent variable.

(ii) **Independence of observations**: the observations in the dataset were collected using statistically valid sampling methods, and there are no hidden relationships among observations.

(iii) **Normality**: The data follows a normal distribution.

(iv) The relationship between the independent and dependent variable is **linear**: the line of best fit through the data points is a straight line (rather than a curve or some sort of grouping factor).

If the data do not meet the assumptions of homoscedasticity or normality, it may be able to use a nonparametric test instead, such as the Spearman rank test.

3.3 The Multiple Linear Regression Model

Multiple regression is an extension of simple linear regression. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we want to predict is called the dependent variable (or sometimes, the outcome, target or criterion variable). The variables we are using to predict the value of the dependent variable are called the independent variables (or sometimes, the predictor, explanatory or regressor variables).

Multiple regression also allows to determine the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained. For example, it might the want to know how much of the variation in exam performance can be explained by revision time, test anxiety, lecture attendance and gender "as a whole", but also the "relative contribution" of each independent variable in explaining the variance.

The multiple linear regression models are an extension of a simple linear regression model to incorporate two or more independent variables in a prediction equation for a response variable. The use of two or more independent variables regression analysis is an extension of the basic principles used in two variable regression analysis. It is necessary to determine the equation for the average relationship between the variable.

The multiple regression models with k independent variables is

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2+} \beta_3 X_{i3} + \cdots + \beta_k X_{ik} + \varepsilon_i, \qquad i = 1, 2, \ldots, n \qquad (3.2)$$

Where,

Y_i = value of the dependent variable in the i^{th} observation

β_0 = intercept

$\beta_1, \beta_2, \ldots \beta_k$ = regression coefficient associated with each of the X_k independent variables

X_j = value of the j^{th} independent variable in the i^{th} observation

ε_i = random error terms

3.3.1 Assumptions of Multiple linear regression

There are four assumption of multiple linear regression.

(i) Firstly, the multiple linear regression requires that the relationship between the independent and dependent variable to be linear. The linearity assumption can be tested with scatter diagram.

(ii) Secondly, it requires that the errors between observed and predicted values (i.e. the residuals of the regression) should be normally distributed. This assumption may be checked by looking at a histogram or P.P. plot.

(iii) Thirdly, multiple linear regressions assumed that there is no multicollinearity in the data. Multicollinearity occurs when the independent variable is too highly correlated with each other.

(iv) The last assumption of multiple linear regressions is homoscedasticity.

A scatter plot of residuals versus predicted values is good way to check for homoscedasticity. There should be no clear pattern in the distribution; if there is a cone-shaped pattern, the data is heteroscedastic.

3.3.2 Multicollinearity

Multicollinearity is the occurrence of high intercorrelations among independent variables in a multiple regression model. Multicollinearity can lead to skewed or misleading results when a researcher or analyst attempts to determine how well each independent variable can be used most effectively to predict or understand the dependent variable in a statistical model. In general, multicollinearity can lead to wider confidence intervals and less reliable probability values for the independent variables. That is, the statistical inferences from a model with multicollinearity may not be dependable.

3.3.3 Homoscedasticity and Heteroscedasticity

Homoscedasticity is the variance of the error term is the same for all observations. Heteroscedasticity is the variance of the error term is not the same for all observations. A critical assumption of the classical linear regression model is that the disturbances u_i have all the same variance. When this condition holds, the error terms are homoscedastic, which means the error have the same scatter regardless of the value of X. When the scatter of the errors is different, varying depending on the value of one or more of the independence variables, the error terms are

heteroscedastic. The opposite of homoscedasticity is the phenomenon of the heteroscedasticity, where the error term can be formulated as a function of x_i. This can be described in mathematical terms as Var (e_i) = σ^2 where e_i is the error term and x_i is the measure of some covariate.

3.4 Wealth Index

The Wealth Index is a composite measure of the cumulative living standard of a household. The Wealth Index is calculated using data on a household's ownership of selected set of assets, such as televisions, bicycles, and cars; dwelling characteristics such as flooring material; type of drinking water source; and toilet and sanitation facilities. The Wealth Index considers characteristics that are related to wealth status, avoiding variables that do not represent an asset, or outcome variables.

Since the late 1990s, wealth indices have become widely used instruments for measuring economic status of households in low and middle-income countries. Hundreds of research papers have appeared in which wealth indices were used for studying variation in health, mortality, poverty, education, work and other outcomes in almost all countries of the developing world (e.g. Gwatkin et al., 2007; Howe et al., 2008; Filmer & Scott, 2012; Falkinham & Namazie, 2002). Wealth indices are considered effective indicators of long-term socio-economic position, living standard or material well-being of households (Filmer & Pritchett, 1999, 2001; Sahn & Stifel, 2000, 2003; McKenzie, 2005; Howe et al., 2008). They often perform as well or better than expenditure data in explaining variation in education, child mortality, nutrition, fertility and health care use (Filmer & Pritchett, 2001; Bollen et al., 2002; Sahn & Stiefel, 2003; McKenzie, 2005; Filmer & Scott, 2012).

Asset based wealth indices are widely used instruments for measuring the economic situation of households in developing countries. Most household surveys currently available for these countries include such an index based on the possession of consumer durables and housing characteristics. Wealth indices owe this success to their intuitive appeal, wide availability, ease of computation, and reliability of measurement. However, in spite of these desirable properties, they suffer of one great problem: They are not comparable between surveys. So, human's occupation, income and wealth are related to the socio-economic composition.

3.4.1 Principal Component Analysis (PCA)

Principal Component Analysis, or PCA, is a dimensionality-reduction method that is often used to reduce the dimensionality of large data sets, by transforming a large set of variables into a smaller one that still contains most of the information in the large set.

Reducing the number of variables of a data set naturally comes at the expense of accuracy, but the trick in dimensionality reduction is to trade a little accuracy for simplicity. Because smaller data sets are easier to explore and visualize and make analyzing data much easier and faster for machine learning algorithms without extraneous variables to process. So to sum up, the idea of PCA is simple reducing the number of variables of a data set, while preserving as much information as possible.

Given a data matrix with p variables and n samples, the data are first centered on the means of each variable. This will insure that the cloud of data is centered on the origin of our principal components, but does not affect the spatial relationships of the data nor the variances along our variables. The first principal components (Y_1) is given by the linear combination of the variables $X_1, X_2, \dots, X_p$

$$\boldsymbol{Y_1 = a_{11}X_1 + a_{12}\,X_2 + \dots + a_{1p}X_p} \tag{3.3}$$

or, in matrix notation

$$\boldsymbol{Y_1 = a^T{}_1 X}$$

The first principal component is calculated such that it accounts for the greatest possible variance in the data set. Of course, one could make the variance oY_1 f as large as possible by choosing large values for the weights, $a_{11}, a_{12} \dots . a_{1p}$. To prevent this, weights are calculated with the constraint that the sum of squares is 1.

$$\boldsymbol{a_{11}{}^2 + a_{12}{}^2 + \dots + a_{1p}{}^2 = 1} \tag{3.4}$$

The second principal component is calculated in the same way, with the condition that it is uncorrelated with (i.e., perpendicular to) the first principal component and that it accounts for the next highest variance.

$$\boldsymbol{Y_1 = a_{21}X_1 + a_{22}X_2 + \dots + a_{2p}} \tag{3.5}$$

This continues until a total of p principal components have been calculated, equal to the original number of variables. The sum of the variances of all of the principal components will equal the sum of the variances of all of the variables, that is, all of the original information has been explained or accounted for. Collectively, all of the transformations of the original variables to the principal components is

$$\mathbf{Y = XA} \tag{3.6}$$

Calculating the transformations or weights requires a computer for all but the smallest matrices. The rows of matrix A are called the eigenvectors of matrix Sx, the variance-covariance matrix of the original data. The elements of an eigenvector are the weights a_{ij} and are also known as loadings. The elements in the diagonal of matrix Sy, the variance-covariance matrix of the principal components, are known as the eigenvalues. Eigenvalues are the variance explained by each principal component, and to repeat, are constrained to decrease monotonically from the first principal component to the last. The eigenvalues are commonly plotted on a scree plot to show the decreasing rate at which variance is explained by additional principal components.

The positions of each observation in this new coordinate system of principal components are called scores and are calculated as linear combinations of the original variables and the weights a_{ij}. For example, the score for the rth sample on the kth principal component is calculated as

$$\boldsymbol{Y_{rk} = a_{1k}x_{r1} + a_{2k}x_{r2} + \ldots + a_{pk}x_{rp}} \tag{3.7}$$

In interpreting the principal components, it is often useful to know the correlations of the original variables with the principal components.

The correlation of variable X_i and principal component Y_j is

$$\boldsymbol{r_{ij} = \sqrt{a_{ij}^2 Var(Y_j) / S_{ii}}} \tag{3.8}$$

Because reduction of dimensionality, PCA is focusing on a few principal components versus many variables, is a goal of principal components analysis, several criteria have been proposed for determining how many PCs should be investigated and how many should be ignored. One common criteria is to ignore principal components at the point at which the next PC offers little increase in the total variance explained. A second criteria is to include all second criteria PCs up to a predetermined total percent variance explained, such as 90 percent. A third standard is to ignore components whose variance explained is less than 1 when a correlation matrix is used or less than the average variance explained when a covariance matrix is used, with the idea being such a PC offers less than one variable's worth of information. A fourth standard is to ignore the last PCs whose variance explained is all roughly equal.

Principal components are equivalent to major axis regressions. As such, principal components analysis is subject to the same restrictions as regression, in particular multivariate normality. The distributions of each variable should be checked for normality and transforms used where necessary to correct high degrees of skewness in particular. Outliers should be removed from the data set as outliers can dominate the results of a principal components analysis.

(i) Kaser-Meyer-Olkin (KMO) Test (or) Test for PCA

Kaser-Meyer-Olkin (KMO) Test is a measure of how suited data is for Factor Analysis. The test measures sampling adequacy for each variable in the method and for the complete model. The statistic is measure of the proportion of variance among variables that might be common variance. The lower the proportion, the more suited data is to Factor Analysis. KMO returns values between 0 and 1. A rule of thumb for interpreting the statistic are KMO values between 0.8 and 1 indicate the sampling is adequate, KMO values less than 0.6 indicate the sampling is not adequate and that remedial action should be taken. Some authors put this value at 0.5, so own judgment for values between 0.5 and 0.6 and KMO values close to zero means that there are large partial correlation compared to the sum of correlation. In other words, there are widespread correlations which are a large $\sum$ problem for factor analysis.

For reference, Kaiser put the following values on the results are 0.00 to 0.49 unacceptable, 0.50 to 0.59 miserable, 0.60 to 0.69 mediocre, 0.70 to 0.79 middling, 0.80 to 0.89 meritorious and 0.90 to 1.00 marvelous.

The formula for the KMO test is

$$\mathrm{MO}_j = \frac{\sum_{i \neq j} r_{ij}^2}{\sum_{i \neq j} r_{ij}^2 + \sum_{i \neq j} \mu} \tag{3.9}$$

Where;

R = $[r_{ij}]$ is the correlation matrix and

U = $[\mu_{ij}]$ is the partial covariance matrix

(ii) Bartlett's Test of Sphericity

Bartlett's test of Sphericity tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for structure detection. Small values (less than 0.05) of the significance

level indicate that a factor analysis may be useful with the data. The formula for Bartlett's test is

$$x^2 = -\left(n - 1 - \frac{2p-5}{6}\right) Ln|R| \tag{3.10}$$

3.5 Binary Logistic Regression

Logistic regression can be binomial, ordinal or multinomial. Binomial or binary logistic regression deals with situations in which the observed outcome for a dependent variable can have only two possible types, "0" and "1" (which may represent, for example, "dead" vs. "alive" or "win" vs. "loss"). Multinomial logistic regression deals with situations where the outcome can have three or more possible types (e.g., "disease A" vs. "disease B" vs. "disease C") that are not ordered. Ordinal logistic regression deals with dependent variables that are ordered.

A binary logistic regression model, the dependent variable has two levels (categorical). Outputs with more than two values are modeled by multinomial logistic regression and, if the multiple categories are ordered, by ordinal logistic regression (for example the proportional odds ordinal logistic model). The logistic regression model itself simply models probability of output in terms of input and does not perform statistical classification (it is not a classifier). Logistic regression model can be used to make a classifier, for instance by choosing a cutoff value and classifying inputs with probability greater than the cutoff as one class, below the cutoff as the other; this is a common way to make a binary classifier. The coefficients are generally not computed by a closed form expression, unlike linear least squares. The logistic regression as a general statistical model was originally developed and popularized primarily by Joseph Berkson, beginning in Berkson (1944).

In binary logistic regression, the outcome is usually coded as "0" or "1", as leads to the most straightforward interpretation. If a particular observed outcome for the dependent variable is the noteworthy possible outcome (referred to as a "success" or an "instance" or a "case") it is usually coded as "1" and the contrary outcome (referred to as a "failure" or a "no instance" or a "noncash") as "0". Binary logistic regression is used to predict the odds of being a case based on the values of the independent variables (predictors). The odds are defined as the probability that a particular outcome is a case divided by the probability that it is a no instance.

Binary logistic regression is a type of regression analysis that is used to estimate the relationship between a dichotomous dependent variable and dichotomous, interval and ratio-level independent variables. Many different variables of interest are dichotomous e.g., whether or not someone voted in the last election, whether or not someone is a smoker, whether or not one has a child, whether or not one is unemployed, etc.

Binary logistic regression types of variables are often referred to as discrete or qualitative. Many discrete or qualitative variables can be thought of as events. Dichotomous or dummy variables are usually coded 1, indicating "success" or "yes," and 0, indicating "failure" or "no." The mean of a dichotomous variable coded 1 and 0 is equal to the proportion of cases coded as 1, which can also be interpreted as a probability.

1 1 1 1 1 1 0 0 0 0

mean = 6 / 10 = 0.6 = the probability that any 1 case out of 10 has a score of 1

Researchers used OLS regression to analyse dichotomous outcomes. OLS regression was based on the idea that predicted values ($\hat{y}$) based on the regression results generally range from 0 to 1 and are equivalent to predicted probabilities, predicted proportions, and predicted percent of "success" given values on the independent variables.

In other words, if regressed a dummy variable, voted or not, on education and got the estimate b = 0.025, then it can be said that a one-unit increase in education increases the probability of voting by 0.025. Equivalently, a one-unit increase in education increases the proportion voting by 0.025. Finally, a one-unit increase in education increases the percent voting by 2.5 percent. Due to a number of conceptual and statistical problems, however, people no longer use OLS regression to analyse dichotomous dependent variables. There are a number of alternative approaches to modelling dichotomous outcomes including logistic regression, probity analysis, and discriminant function analysis. Logistic regression is by far the most common. Additionally, it will be focused on binary logistic regression as opposed to multinomial logistic regression used for nominal variables with more than 2 categories.

3.5.1 Binary Logistic Regression Model

The binary logistic regression model has extensions to more than two levels of the dependent variable. Binary logistic regression model can be expressed as follows.

$$\text{logit}(p) = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k + \varepsilon \quad (3.11)$$

Where, p is defined as the success probability. The coefficients βs are the parameters in the model, X_i are the explanatory variables and e is an error term. As p ranges from 0 to 1, the logit (p) ranges from -∞ to +∞. $\frac{p}{1-p}$ is the odd ratio or likelihood ratio and logit (p) is talking the natural logarithm of odd ratio. If p is the probability that a family will own a house, 1-p is the probability that a family will not own a house. Maximum likelihood method is used to obtain unknown constants $(\beta_0, \beta_1, \ldots)$.

Taking the exponent on both sides of binary logistic regression model.

$$\frac{p}{1-p} = e^{\beta_0+\beta_1 X_1+\cdots+\beta_k X_k+\varepsilon} \quad (3.12)$$

By simple algebraic manipulation, the probability the Y=1 is

$$p = \frac{e^{\beta_0+\beta_1 X_1+\cdots+\beta_k X_k+\varepsilon}}{1+e^{\beta_0+\beta_1 X_1+\cdots+\beta_k X_k+\varepsilon}} \quad (3.13)$$

3.5.2 Assumption of Binary Logistic Regression Model

(i) First, binary logistic regression requires the dependent variable to be binary and ordinal logistic regression requires the dependent variable to be ordinal.

(ii) Second, logistic regression requires the observations to be independent of each other. In other words, the observations should not come from repeated measurements or matched data.

(iii) Third, logistic regression requires there to be little or no multicollinearity among the independent variables. This means that the independent variables should not be too highly correlated with each other.

(iv) Fourth, logistic regression assumes linearity of independent variables and log odds. although this analysis does not require the dependent and independent variables to be related linearly, it requires that the independent variables are linearly related to the log odds.

(v) Finally, logistic regression typically requires a large sample size. A general guideline is that you need at minimum of 10 cases with the least frequent outcome for each independent variable in your model.

CHAPTER 4
EFFECT OF SOCIO-ECONOMIC FACTORS ON POVERTY ON FLOODED AREA OF HOUSEHOLDS IN SHAN KA LAY KYUN VILLAGE

In this section, the data is collected from the survey through questionnaire administration are organized, analyzed and interpreted in accordance with the methods and procedures.

4.1 Demographic and Socio-economic Characteristics of Households in Shan Ka Lay Kyun Village

Demographic and socio-economic characteristics of households in Shan Ka Lay Kyun village are stated by gender, age, education, occupation, family size and students' size.

4.1.1 Gender of The Household Heads in Shan Ka Lay Kyun Village

In table 4.1, it shows gender of the household heads in Shan Ka Lay Kyun Village.

Table 4.1 Gender of The Household Heads

Gender	Number of Households	Percentage
Male	249	83.0
Female	51	17.0
Total	300	100

Source: Survey Data (2021)

According to the results in table 4.1, 83.0 percent of household heads are males and the remaining 17.0 percent are females.

4.1.2 Age of The Household Heads in Shan Ka Lay Kyun Village

Table 4.2, descriptive analysis for age of the household heads in Shan Ka Lay Kyun Village. According to following table 4.2, the ages of household heads have been categorized into seven groups. The age group between 19-28 years includes 7.7 percent, the age group between 29-38 years includes 20.7 percent, the age group between 39-48 years includes 21.0 percent, the age group between 49-58 years includes 25.0 percent and the age group between 59-68 years includes 18.0 percent,

the age group between 69-78years includes 6.7 percent, the age group between 79-88 years includes 1.0 percent respectively. The age group between 49-58 years is the largest with 25.0 percent and the age group between 79-88 years is the smallest with 1.0 percent.

Table 4.2 Age of The Household Heads

Age	Number of Households	Percentage
19-28	23	7.7
29-38	62	20.7
39-48	63	21.0
49-58	75	25.0
59-68	54	18.0
69-78	20	6.7
79-88	3	1.0
Total	300	100

Source: Survey Data (January, 2021)

4.1.3 Education Level of The Households Heads in Shan Ka Lay Kyun Village

In table 4.3, shows education level of the household heads in Shan Ka Lay Kyun Village.

Table 4.3 Education Level of The Household Heads

Education Level	Number of Households	Percentage
Illiterate	6	2.0
Monastic Education	3	1.0
Primary	137	45.7
Middle	97	32.3
High	37	12.3
University	4	1.3
Graduate	16	5.3
Total	300	100

Source: Survey Data (2021)

According to table 4.3, it shows the educational level of household's heads. Educational levels are classified as illiterate, Monastic education, primary, middle, high school, university and graduate. There is household that has illiterate. According

to survey data, six household heads have illiterate, its percentage is 2.0 percent. Three household heads completed monastic education level. One hundred and thirty-seven household heads completed primary education level. Ninety- seven household heads completed middle education level. Thirty-seven household heads completed higher education level. Four household heads completed university education level. Fourteen household heads completed graduate education level. In terms of the educational qualification of the respondents, majority of them, 2.0 percent are the illiterate. And then, 1.0 percent are the monastery education level, 45.7 percent are the primary education level, 32.3 percent are the middle education level, 12.3 percent are the high school level, followed by 1.3 percent and 5.3 percent for university and graduate education level respectively. The education level in village is most in primary level due to the limited access to higher education opportunity in the past.

4.1.4 Occupation of The Households Heads in Shan Ka Lay Kyun Village

In table 4.4, it shows occupation of household heads in Shan Ka Lay Kyun Village.

Table 4.4 Occupation of The Household Heads

Occupation	Number of Households	Percentage
Agriculture	63	21.0
Private Owner	67	22.3
Government Employee	6	2.0
Private organization employee	21	7.0
Random Worker	105	35.0
Dependent	38	12.7
Total	300	100

Source: Survey Data (2021)

According to table 4.4, 21.0 percent of household heads' occupation are agriculture, 22.3 percent of household heads are private owner, 2.0 percent of household heads are government employee, 7.0 percent of household heads are private organization employee, 35. percent household heads are random workers and 12.7 percent of household heads are dependent.

4.1.5 Family Size of The Households in Shan Ka Lay Kyun Village

In table 4.5, shows family size of the households in Shan Ka Lay Kyun Village.

Table 4.5 Family Size of The Households

Family Size	Number of Households	Percentage
1	6	2.0
2	45	15.0
3	83	27.7
4	76	25.3
5	42	14.0
6	21	7.0
7	15	5.0
8	6	2.0
9	4	1.3
10	1	0.3
11	1	0.3
Total	300	100

Source: Survey Data (2021)

According to table 4.5, six households have one family member, it is 2.0 percent. Forty-five households have two family members, it is 15.0 percent. Eighty-three households have three family members, it is 27.7 percent. Seventy-six households have four family members, it is 25.3 percent. Forty-two households have five family members, it is 14.0 percent. Twenty-one households have six family members, it is 7.0 percent. Fifteen households have seven family members; it is 5.0 percent. Six households have eight family members, it is 2.0 percent. Four households have nine family members, it is 1.3 percent. One household have ten family members, it is 0.3 percent. One household has eleven family members, it is 0.3 percent. According to this data, the highest family size of households is eighty-three households that have three family members, it is 27.7 percent. The lowest family size of households is one household that have ten and eleven family members, it is 0.3 percent. The second lowest family size of households is four household that have nine family members, its percentage is 1.3 percent.

4.1.6 Students Size of The Households in Shan Ka Lay Kyun Village

In table 4.6, it shows students size of the households in Shan Ka Lay Kyun Village.

Table 4.6 Students Size of The Households

Student Size	Number of Households	Percentage
0	151	50.3
1	76	25.3
2	57	19.0
3	14	4.7
4	1	0.3
5	1	0.3
Total	300	100

Source: Survey Data (2021)

According to table 4.6, it shows the number of students has a household. The sample households have one to five students in a family. There is household that has no students. According to the following table, one hundred and fifty-one households have no students and its percentage is 50.3 percent. Seventy-six households have only one student, it is 25.3 percent. Fifty-seven households have two students, it is 19.0 percent. Fourteen households have three students, it is 4.7 percent. One household has four students, it is 0.3 percent. One household has five students, it is 0.3 percent. According to this data, the highest student size of households is one hundred and fifty-one households that have no students and it is 50.3 percent. And the second highest student size of households is seventy-six households that have only one student, it is 25.3 percent. The lowest student size of household is one household that has five students, it is 0.3 percent.

4.2 Ownership of Households in Shan Ka Lay Kyun Village

The following tables are shown by transportation facilities, entertainment facilities, loan condition, home ownership, housing type, sanitation, distance from important centers and source of drinking, source of energy, source of fuel and garbage system.

4.2.1 Ownership of Land Ownership of Households in Shan Ka Lay Kyun Village

Table 4.7 shows land ownership of households in Shan Ka Lay Kyun Village.

Table 4.7 Land Ownership of Households

Land Ownership	Number of Households	Percent
Yes	277	92.3
No	18	6.0
Others	5	1.7
Total	300	100

Source: Survey Data (2021)

According to the following table, 277 households have land and its percentage is 92.3 percent, 18 households have no land and its percentage is 6.0 percent.

4.2.2 Ownership of Transportation Facilities of Households in Shan Ka Lay Kyun Village

Table 4.8 shows ownership of transportation facilities of households in Shan Ka Lay Kyun Village.

Table 4.8 Transportation Facilities of Households

Types of Facilities	Yes		No	
	Households	Percent	Households	Percent
Car	33	11.0	267	89.0
Mini Oway	4	1.3	296	98.7
Cycle	281	93.7	19	6.3
Bicycle	54	18.0	246	82.0
Tricycle	6	2.0	294	98.0
Tricar	4	1.3	296	98.7
Horsebox	11	3.7	289	96.3

Source: Survey Data (2021)

. According to above table 4.8, thirty-three households have own car and its percentage is 11.0 percent, four households have mini oway and its percentage is 1.3 percent, two hundred and eighty one households have cycle and its percentage is 93.7

percent, fifty-four households have bicycle and its percentage is 18.0 percent, six households have tricycle and its percentage is 2.0 percent, four households have tricar and its percentage is 1.3 percent and eleven households have horsebox and its percentage is 3.7 percent respectively.

4.2.3 Ownership of Entertainment Facilities of Households in Shan Ka Lay Kyun Village

Table 4.9 shows ownership of entertainment facilities of households in Shan Ka Lay Kyun Village. According to the following table 4.9, two hundred and eighty-two households own TV, VCD and its percentage is 94.0 percent. Two hundred and sixteen households' own radio and its percentage is 72.0 percent.

Table 4.9 Entertainment Facilities of Households

Types of Facilities	Yes		No	
	Households	Percent	Households	Percent
TV, VCD	282	94.0	18	6.0
Radio	216	72.0	84	28.0

Source: Survey Data (2021*)*

4.2.4 Ownership of Home Appliances and Others of Households in Shan Ka Lay Kyun Village

Table 4.10 shows the ownership for refrigerator, telephone, rice cooker, sewing machine, gas stove and others of households in Shan Ka Lay Kyun Village. According to the following table 4.10, 76.3 percent of households own refrigerator, 97.3 percent of households own telephone, 96.3 percent of households own rice cooker, 10.0 percent of households own sewing machine, 4.0 percent of households own gas stove and 30.0 percent of households own others.

Table 4.10 Ownership of Home Appliances and Others of Households

Categories	Yes		No	
	Households	Percent	Households	Percent
Refrigerator	229	76.3	71	23.7
Telephone	292	97.3	8	2.7
Rice Cooker	289	96.3	11	3.7
Sewing Machine	30	10.0	270	90.0
Gas Stove	12	4.0	288	96.0
Others	90	30.0	210	70.0

Source: Survey Data (2021)

4.2.5 Loan Condition of Households in Shan Ka Lay Kyun Village

Table 4.11 shows the loan condition of households in Shan Ka Lay Kyun Village.

Table 4.11 Loan Condition of Households

Loan of Households	Number of Households	Percentage
Yes	28	9.3
No	272	90.7
Total	300	100

Source: Survey Data (2021)

According to the above table, 28 households have loan and it is 9.3 percent. Remaining 272 households do not have loan and it is 90.7 percent.

4.2.6 Home Ownership Status of The Households in Shan Ka Lay Kyun Village

Table 4.12 shows housing ownership of the households in Shan Ka Lay Kyun Village. According to following table 4.12, 280 households have own house and its percentage is 93.3 percent, 7 households have rent houses and its percentage is 2.3 percent and the others are 4.3 percent.

Table 4.12 Housing Ownership of Households

Ownership Status	Number of Households	Percent
Own	280	93.3
Rent	7	2.3
Others	13	4.3
Total	300	100

Source: Survey Data (2021)

4.2.7 Housing Type of Households in Shan Ka Lay Kyun Village

Table 4.13 shows the housing types of households in Shan Ka Lay Kyun Village. According to the following table 4.13, most of the houses were wood houses and it is 80 percent. RC houses are 3.0 percent, brick houses are 15.7 percent and bamboo houses are 2.5 percent.

Table 4.13 Housing Type of Households

Housing Type	Number of Households	Percent
RC	9	3.0
Brick	47	15.7
Wood	240	80.0
Bamboo	4	1.3
Total	300	100

Source: Survey Data (2021)

4.2.8 Sanitation Condition of Households in Shan Ka Lay Kyun Village

Table 4.14 shows sanitation condition of households in Shan Ka Lay Kyun Village.

Table 4.14 Type of Sanitation Used by Households

Type	Number of Households	Percent
Using water toilet	194	64.7
Tradition	99	33.0
No	7	2.3
Total	300	100

Source: Survey Data (2021)

According to the above table 4.14, 194 households use the covered pit toilets, it is 64.7 percent. 99 households use traditional toilets, and 7 households do not have toilets.

4.2.9 Accessibility to Important Centers by Households in Shan Ka Lay Kyun Village

Table 4.15 shows distance from important centers of households in Shan Ka Lay Kyun Village. According to the following table 4.15, 240 households answered "near from school". 275 households answered "near from clinic". 261 households answered "near from clinic". 253 households answered "near from hospital".

Table 4.15 Accessibility to Important Centers by Households

Type	Near	Percent	Far	Percent	Total	Percent
School	240	80	60	20	300	100
Bazaar	275	91.7	25	8.3	300	100
Clinic	261	87.0	39	13.0	300	100
Hospital	253	84.3	47	15.7	300	100

Source: Survey Data (2021)

4.2.10 Source of Drinking Water of Households in Shan Ka Lay Kyun Village

Table 4.16 shows source of drinking water of households in Shan Ka Lay Kyun Village.

Table 4.16 Source of Drinking Water of Households

Sources of Water	Number of Households	Percent
Fresh Water	110	36.7
Well	1	0.3
Tube Well	187	62.3
River	2	0.7
Total	300	100

Source: Survey Data (2021)

According to the above table, most of the households got from fresh water, it is 36.7 percent. Only one household get from well, it is 0.3 percent.

4.2.11 Source of Fuel for Cooking of Households in Shan Ka Lay Kyun Village

Table 4.17 shows source of fuel for cooking of households in Shan Ka Lay Kyun Village. According to the following table 4.17, 74.3 percent of households use electricity, 24.3 percent of households use fire wood/charcoal and only 1.3 percent use gas.

Table 4.17 Source of Fuel for Cooking of Households

Sources of Cooking	Number of Households	Percent
Electricity	223	74.3
Fire Wood/Charcoal	73	24.3
Gas	4	1.3
Total	300	100

Source: Survey Data (2021)

4.2.12 Source of Energy of Households in Shan Ka Lay Kyun Village

Table 4.18 shows source of energy of households in Shan Ka Lay Kyun Village. According to following table 4.18, 82.0 percent of households use electricity, 17.0 percent of households use battery, 0.7 percent of households use solar and only 0.3 percent of household use generator.

Table 4.18 Source of Energy of Households

Sources of Energy	Number of Households	Percent
Electricity	246	82.0
Battery	51	17.0
Solar	2	0.7
Generator	1	0.3
Total	300	100

Source: Survey Data (2021)

4.2.13 Garbage System of Households in Shan Ka Lay Kyun Village

Table 4.19 shows the garbage system of households in Shan Ka Lay Kyun Village. According to following table 4.19, 8.3 percent of households do waste bin, 0.3 percent of households do garbage fire, 86.3 percent of households do river or stream and 5.0 percent of households do no space.

Table 4.19 Garbage System of Households

Garbage System	Number of Households	Percent
Waste bin/ Rubbish car/Cart	25	8.3
Garbage Fire	1	0.3
River or Stream	259	86.3
No space	15	5.0
Total	300	100

Source: Survey Data (2021)

4.2.14 The Remaining Households Members After a Flood in Shan Ka Lay Kyun Village

In table 4.20, it shows in the remaining household members after a flood in Shan Ka Lay Kyun Village.

Table 4.20 The Remaining Households Members After a Flood

Categories	Frequency	Percent
1	6	2.0
2	45	15.0
3	84	28.0
4	74	24.7
5	43	14.3
6	20	6.7
7	16	5.3
8	7	2.3
9	5	1.7
Total	300	100.0

Source: Survey Data (2021)

According to above table 4.20, one household member remains at home in six households. Two household members remain at home in forty-five households. Three household members remain at home in eighty-four households. Four household members remain at home in seventy-four households. Five household members remain at home in forty-three households. Six household members remain at home in twenty households. Seven household members remain at home in sixteen households. Eight household members remain at home in seven households. Nine household members remain at home in five households.

4.2.15 The Length of Stay in Shan Ka Lay Kyun Village of Households

In table 4.21, it shows the length of stay in Shan Ka Lay Kyun Village of households.

Table 4.21 The Length of Stay in Shan Ka Lay Kyun Village of Households

Length in Years	Frequency	Percent
19-28	29	9.7
29-38	65	21.7
39-48	66	22.0
49-58	79	26.3
59-68	61	20.3
Total	300	100.0

Source: Survey Data (2021)

According to table 4.21, 29 households live between 19-28 years, 65 households lived between 29-38 years, 66 households live between 39-48 years, 79 households alive between 49-58 years and 61 households live between 59-68 years in this village.

4.2.16 The Place where People Live in Case of Flood in Shan Ka Lay Kyun Village

In table 4.22, it shows the place where people in case of flood in Shan Ka Lay Kyun Village. According to the following table 4.22, all households live upstairs in the event of a flood. Most households prepare for the floods by moving their belongings to the floodpain.

Table 4.22 The Place where People Live in Case of Flood of Households

Categories	Frequency	Percent
Upstairs	300	100

Source: Survey Data (2021)

4.3 Economic Condition of Households in Shan Ka Lay Kyun Village

Economic condition of households in Shan Ka Lay Kyun village is shown with monthly income of households and monthly expenditure according to the survey data of this village.

4.3.1 Monthly Income of Households

Table 4.23 shows the monthly income for households in Shan Ka Lay Kyun Village.

Table 4.23 Monthly Income for Households

Income (Kyats)	Number of Households	Percent
90000-374999	179	59.7
375000-659999	94	31.3
660000-944999	16	5.3
945000-1229999	6	2.0
1230000-1514999	3	1.0
1515000-1799999	2	0.7
Total	300	100.0

Source: Survey Data (2021)

According to above table 4.23, the monthly income of 179 households is under 374999 Kyats. The least monthly income was Kyats 90000. The monthly income of 94 households is between 375000 and 659999 Kyats, the monthly income of 16 households is between 660000 and 966999 Kyats, the monthly income of 6 households is between 945000 and 1229999 Kyats, the monthly income of 3 households is between 1230000 and 1514999 Kyats, the monthly income of 2 households is between 1515000 and 1799999 Kyats respectively.

4.3.2 Monthly Expenditure of Households

Table 4.24 shows monthly expenditure of households in Shan Ka Lay Kyun Village.

Table 4.24 Monthly Expenditure of Households

Expenditure (Kyats)	Number of Households	Percent
22100-162099	92	30.7
162100-302099	150	50.0
302100-442099	40	13.3
442100-582099	12	4.0
582100-722099	3	1.0
722100-862099	3	1.0
Total	300	100.0

Source: Survey Data (2021)

According to the **t**able 4.24, the monthly expenditure of 92 households is under 162099 Kyats. The least monthly expenditure is Kyats 22100. The monthly expenditure of 3 households is between 722100 and 862099 Kyats.

4.4 Effects of Factors on Total Expenses of Households in Shan Ka Lay Kyun Village

The multiple regression analysis was applied to investigate the factors of total expenses in sample households of villagers in Shan Ka Lay Kyun Village. To develop the multiple regression model, the total expenses of household was used as dependent variable and total income, occupation, live time in each household were used as independent variables.

The estimated multiple regression model is

$$\widehat{Y_i} = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 \quad (4.1)$$

Y_i = Total expenses of household

X_i' = Vector of independent variables = [X_1, X_2 , ...]

X_1 = Total income

X_2 = Length of stay

X_3 = Family size

X_4 = Number of student

Table 4.25 Results of Multiple Regression Model

Independent Variable	Coefficients	Standard error	t	Sig	VIF
Constant	65281.385	20978.302	3.112	0.002	
Total income	0.374***	0.019	19.277	0.000	1.005
Length of Stay	321.380*	368.138	0.873	0.083	1.048
Family size	2645.193**	3234.475	0.818	0.014	1.361
No. of student	-3066.288*	5724.861	-0.536	0.093	1.377
Adjusted R^2	0.556				
F-value	94.780				

Source: Survey Data (2021)

Dependent variable: Monthly expenditure

*** denotes significant at 1 percent level, ** denotes significant at 5 percent level,

* denotes significant at 10 percent level

Multiple Regression equation is

$$\hat{Y} = 65281.385 + 0.374X_1 + 321.380X_2 + 2645.193X_3 - 3066.288X_4 \quad (4.2)$$

Results show that F value is 94.780 that is significant at p=0.000(<0.01), suggesting that independent variables have significantly. Adjusted R^2 is 0.556. It had been found that total income, length of stay, family size and number of student of households are statistically significance at 1 percent, 10 percent, 5 percent and 10 percent level respectively. The result shows that average monthly expenditure of households is 65281.385 MMK. The multiple regression equation shows that, total expense is expected to increase by 0.374 MMK, if total income increases by 1 Kyats. If length of stay increased 1 year, total expense is increased by 321.380 MMK. If family size is increased by 1 member, total expense is increased by 2645.193 MMK. If number of students is increased by 1 student, total expense is decreased by 3066.288 MMK. The regression coefficient between total income and total expenses is 0.374 (t=19.277, p=0.000). This shows that there is direct relationship between total income and total expenses. The regression coefficient between length of stay and total expenses is 321.380 (t=0.873, p=0.083). This shows that there is direct relationship between length of stay and total expenses. The regression coefficient between family size and total expenses is 2645.193 (t = 0.818, p = 0.0014). This

shows that there is direct relationship between family size and total expenses. The regression coefficient between number of student and total expenses is -3066.288 (t=-0.536, p=0.093). This shows that there is indirect relationship between number of student and total expenses.

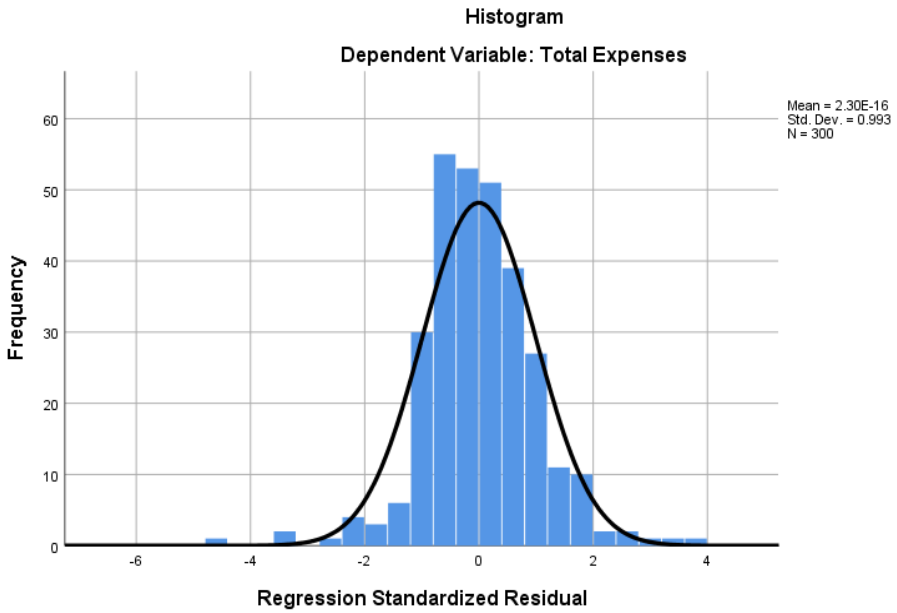
4.4.1 Testing for the Assumptions about Multiple Regression

To determine the violation of required assumption from multiple linear regression model for socio-economic status of households, the following procedures have been used.

(1) Testing for Normality of Disturbances

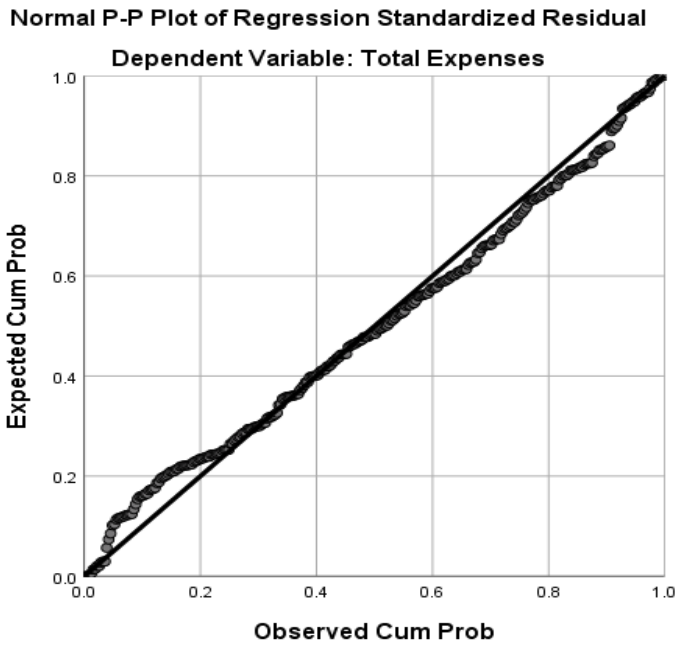
One of the basic assumptions is that disturbances are normally distributed with zero mean and constant variance. To check whether the disturbances are normally distributed, histogram and Normal P-P plot of the disturbances can be constructed. The histogram of the residual and Normal P-P plot for socio-economic position of households are shown in Figure 4.1 and 4.2.

The histogram in Figure 4.1 appears to be pile fashioned. Similarly, the normal probability plots is virtually a straight line. Although the graphs do not provide formal statistical test of normality, graphs do provide a descriptive display. According to histogram and Normal P-P plot, it can be concluded that the normality assumption appears to be generally reasonable.



Source: Survey Data (2021)

Figure 4.1 Histogram for Residual

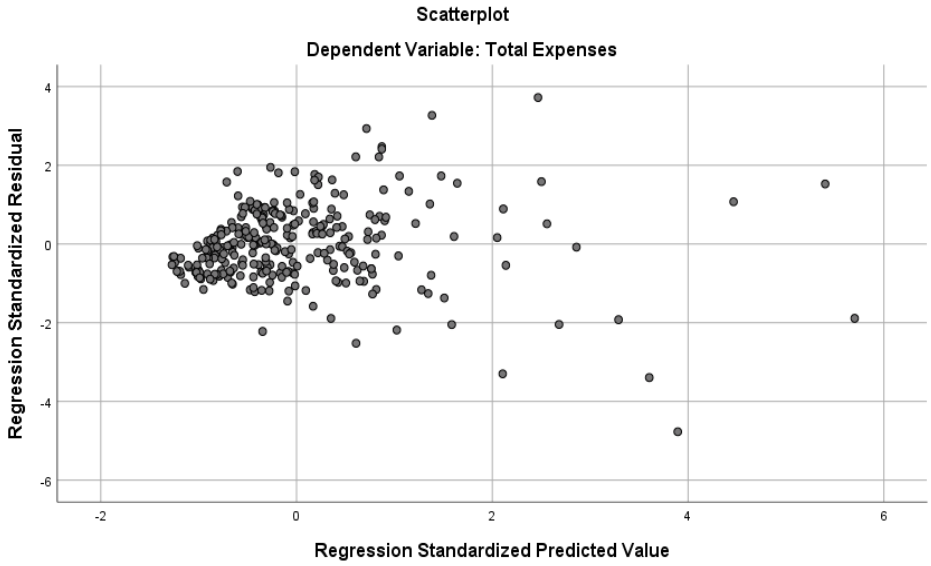


Source: Survey Data (2021)

Figure 4.2 Normal P-P Plot of Regression Residuals

(2) Testing for the Presence of Heteroscedasticity Problem

The two figures are error plots. The White test is to be used in this study to detect the presence of heteroscedasticity. Another basic assumption of the multiple regression model is assumption of homoscedasticity of residuals. Because of the presence of heteroscedasticity, the regression coefficients become less efficient. Heteroscedasticity can often be detected by plotting the estimated Y values against the disturbances. If any pattern is displayed, heteroscedasticity is likely present. Figure 4.3 represents the predicted of total expenses of households on X-axis and the residual values on Y axis.



Source: Survey Data (2021)

Figure 4.3 Scatter Plot for Standardize Residuals and Standardize Predicted Value of Households

This figure shows that heteroscedasticity appears to be absent.

(3) Detecting Multicollinearity

Multicollinearity arises when one of the independent variables is strongly and linearly related to one or more of the other independent variables. Specifically, multicollinearity occurs if there is a high correlation between two independent variables.

Multicollinearity can be detected by the variance inflation factor (VIF). It is measuring the degree of multicollinearity contributed by independent variable. According to estimated results, the VIF for total income, length of stay, family size and number of student are 1.005, 1.048, 1.361 and 1.377 respectively. The sum of VIF for the independent variables is 3.047. Since the sum of the VIF is less than 10, then it is concluded that multicollinearity is not serious problem in the multiple regression model for socio-economic status of households.

4.5 Factor Affecting on Wealth Index of Socio-economic Status of Households in Shan Ka Lay Kyun Villlage

To find out the wealth index of households principal component analysis is used. To conduct the principal component analysis, it is needed to carry out the KMO test and Bartlett's test.

Table 4.26 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.572
Bartlett's Test of Sphericity	Approx. Chi-Square	156.071
	df	55
	Sig.	0.000

Source: Survey Data (2021)

The KMO, measure of sampling adequacy tests whether the partial correlation among items is small. The value of KMO varies between 0 and 1, and the values closer to 1 are better. A value of greater than 0.5 is suggested to be the minimum (Field, 2005). The KMO in table 4.26 is 0.572 which is above 0.5 is satisfactory. Bartlett's Test of Sphericity helps test the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is a matrix in which all the diagonal elements are 1 and all off diagonal elements are 0. According to table 4.26, the Bartlett's Test of Sphericity was significant at 0.000, which means there was a relationship between the variables includes in the analysis. The significant level was small enough to reject the null hypothesis, which means that the correlation matrix was not an identity matrix. Therefore, the observed data can be analyzed by using principal component analysis.

4.5.1 Total Variance Explain of Factors

The sample variation of the components has been described in table 4.27. According to table 4.27 reports the variance explained by each component as well as the cumulative variance explained by each component as well as the cumulative variance explained by all the components. Table 4.27 shows the amount of variance explained by each factor, component 1 explains 12.546 percent of the variance of the items, component 2 to component 5 explains 12.449 percent, 11.643 percent, 11.301 and 10.575 percent of the variance of the items in the component respectively. The cumulative percentage column contains the cumulative percentage of the variance accounted for by the current and all preceding components. According to table 4.27

the 5th row shows a value of 10.575 percent of the total variance.

Table 4.27 Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	Percent of Variance	Cumulative Percent	Total	Percent of Variance	Cumulative Percent
1	1.469	13.353	13.353	1.380	12.546	12.546
2	1.422	12.923	26.276	1.369	12.449	24.995
3	1.285	11.682	37.958	1.281	11.643	36.638
4	1.191	10.829	48.787	1.243	11.301	47.939
5	1.070	9.728	58.515	1.163	10.575	58.515
6	0.967	8.787	67.302			
7	0.897	8.150	75.452			
8	0.787	7.150	82.603			
9	0.762	6.932	89.534			
10	0.588	5.346	94.880			
11	0.563	5.120	100.000			

Source: Survey Data (2021)

4.5.2 Wealth Index of Households in Shan Ka Lay Kyun Villag

Table 4.28 shows wealth index of households in Shan Ka Lay Kyun Villge.

Table 4.28 Wealth Index of Households

Wealth Index	Frequency	Percent
Poorest	63	21.0
Poor	60	20.0
Middle	60	20.0
Rich	60	20.0
Richest	57	19.0
Total	300	100.0

Source: Survey Data (2021)

According to above table, almost of households of 20.0 percent are poor, middle and rich. 21.0 percent of households are poorest and 19.0 percent of

households are richest.

4.6 Binary Logistic Regression

4.6.1 Model Fitting Information of Households in Shan Ka Lay Kyun Village

The results of the overall model evaluation binary logistic regression model are presented in table 4.29.

Table 4.29 Model Fitting Information of Households

Model fitting criteria	Chi Square value	df	p-value
Omnibus Tests of Model Coefficient	89.125	6	0.000
Hosmer and Lemeshow (H-L) Tests	13.308	8	0.102
Cox & Snell R^2	0.257		
Nagelkerke R^2	0.406		
Overall percentage	85.0		

Source: Survey Data (2021)

According to the Omnibus tests of model coefficients gives a Chi-Square of 89.125 on 6 df significant beyond 0.000. There is no evidence of lack of fit based on the H-L statistic (Chi-Square = 13.308, df = 8, p = 0.102). The model fitting information includes two different ways of estimating R square (Cox & Snell R^2 and Nagelkerke R^2). Overall, 85.0 percent of the poverty of households are predicted correctly.

4.6.2 Summary Result for the Binary logistic Regression Model of Households in Shan Ka Lay Kyun Village

Socio-economic status of households are analyzed by using binary logistic regression model. In this model, the total expenditures of household is dependent variable. The binary logistic regression model of socio-economic status can be described as follows.

$$P_{ij} = \mathrm{P}\,(Y_i = {}^{j}/_{x}) = \frac{e^{\beta_j x}}{\sum_{j=1}^{2} e^{\beta_j x}} \quad j=1, 2 ; i=1, 2,\ldots.. \qquad (4.1)$$

Poverty of households in Shan Ka Lay Kyun Village usage is dependent variable and it was given 1 if the poor of households and 0 if non-poor condition of households.

$Y_j =$ Dependent variables

In this study, Y = 1, if household is poor

Y = 0, if households is non-poor

Total income, gender, education, occupation, family size, number of students and loans considered as independent variables. The variables are categorized followed;

X = Vector of independent variables

X_{i1} = Occupation = 1 if household heads occupation is agriculture

= 0 if household heads occupation is others

X_{i2} = Loans Gender = 1 if household heads is male

= 0 if household heads is female

X_{i3} = Total income

X_{i4} = Age

X_{i5} = Gender = 1 if household heads is male

= 0 if household heads is female

X_{i6} = Family size

X_{i7} = Number of students

The summary result for the binary logistic regression model of households in Shan Ka Lay Kyun Village are shown table 4.30.

Table 4.30 Summary Result for the Binary Logistic Regression Model of Households

	B	**S.E**	**Wald**	**Df**	**Sig**	**Exp(B)**
Constant	-3.671	0.722	25.867	1	0.000	0.025
Occupation (1)	-0.521**	0.412	1.599	1	0.006	0.594
Loans	0.281*	0.666	0.178	1	0.073	1.325
Total Income	0.000***	0.000	47.156	1	0.000	1.000
Age	0.000	0.014	0.001	1	0.973	1.000
Gender (1)	-0.163*	0.494	0.108	1	0.074	0.850
Family size	-0.099**	0.118	0.702	1	0.002	0.906
No. of student	-0.086*	0.209	0.170	1	0.080	0.917

Source: Survey Data (2021)

*** denotes significant at 1 percent level, ** denotes significant at 5 percent level, *denotes significant at 10 percent level

It has been found that the coefficient of total income is statistically significant at 1 percent level, occupation and family size are statistically significant at 5 percent

level, loans, gender and number of student are statistically significant at 10 percent level. Total income and loans are positive sign. If the level of household heads in total income is more increasing, the poor situation of households is more increasing 0.000. If there is more increasing in loan as 1 unit, the poor situation of households is more increasing 0.281. Occupation, gender, family size and number of student are negative sign. If there is more increasing in occupation as 1 unit, the poor situation of households is more decreasing 0.521. If the male household heads in households are more increasing, the poor situation of households is more decreasing 0.163. If there is more increasing in family size as 1 unit, the poor situation of households is more decreasing 0.099. If there is more increasing in number of students as 1 unit, the poor situation of households is more decreasing 0.086.

CHAPTER 5
CONCLUSION

This chapter includes three sections which are findings, suggestions and recommendation and needs for further study.

5.1 Findings

In this study of socio-economic position of households in Shan Ka Lay Kyun Village according to the objective one, it can be found that there are fewer females than males. The number of persons in working age group was larger than that of dependents in this village. The volume of labour force was high in this village.

The most population in Shan Ka Lay Kyun Village has primary level education. The most households in Shan Ka Lay Kyun Village owns wood house and live by own houses. In the study of the households by availability and related amenities, it is found that the most available item for amenities is television and radio. Most of the households used motorcycle.

The most households had available electricity for main source of lighting and the least households use generator for source of lighting in Shan Ka Lay Kyun Village. Most of the households got water for drinking from tube well. Most of the households used electricity. Therefore, it can be assumed that the most households of Shan Ka Lay Kyun Village still use electricity for cooking condition. Most of households used the toilet of water flat. Therefore, it can be seen that the sanitation condition was good condition in Shan Ka Lay Kyun Village. As most of the households in Shan Ka Lay Kyun Village throw garbage into the river, it can be water pollution.

The household income level in the study area, it is found that most of the sample households have monthly income of Kyats 90000-374999. In this study it is found that 59.7 percent of the sample households in the study area. The household expenditure level in Shan Ka Lay Kyun Village, it is found that most of the sample households have monthly expenditure of Kyats 22100 -162099. It is found that 30.7 percent of the sample households in the study area. Thus, the economic condition of the sample households in Shan Ka Lay Kyun Village is fairly good.

According to Multiple Regression Model, the relationship between the total expenses and the total income of households are direct relation. If there is more

increasing in the total income of households as 1 unit, the total expenses of households is more increasing in 0.374 kyat. Length of stay of households in that village and family size are also direct relation to the total expenses of households and numbers of student is inverse relation to household's expenses. Therefore, the expenditure of households is depending on income of households, length of stay of households in that village, family size and numbers of student.

Binary logistic regression model is applied to find the relationship between wealth index and the independent variables. When the poverty level is considered as dependent variable, the poverty level can be found more than five categories such as poorest, poorer, middle, rich and richest. According to the binary logistic regression model, total income is not practically significant, although statistically significant at 1 percent. The coefficient of occupation, family size gender, number of students and loans are also statistically significant.

Number of students, family size, gender and occupations are negative sign. If there is more increasing in the student size as 1 person, poorest situation of household is more decreasing in 0.086. If there is more increasing in the occupation of male household's head which is agriculture, the poorest situation of household is more decreasing in 0.163 and 0.521 respectively. Therefore, increasing the family size, number of students and getting occupations are causing to decrease the poorest condition of households. As income and loans is positive sign although something earning and getting loans are no effect on households.

5.2 Suggestions and Recommendations

Most of the households in Shan Ka Lay Kyun Village throw garbage into the river. It can cause water pollution and harm the environment. The involvement of people in social organizations plays an important role in improvement of social environment and also social welfare. Thus, the villagers must be encouraged to involve in social organizations and to emerge more social organizations in Shan Ka Lay Kyun Village.

To achieve all round good socio-economic position of household in Shan Ka Lay Kyun Village, there should has special development schemes and implement the efficiently for earning income and having loans of Shan Ka Lay Kyun Village.

To be more self-confident in household head, to support the families, to reduce the families' poverty and the economic hardship in the lives, awareness training of

family planning must be practiced and job opportunities have to be created to increase economically active members in families. As there is a flood area and has an alluvial soil, cultivation can be produced in focusing on agriculture with systematic and modernise farming methods. If there is economic development in the region, poverty can be alleviated to develop.

5.3 Needs for Further Study

This study is focused on factors affecting on poverty level of households in flooded area of Shan Ka Lay Kyun Village. The following needs for further studies were recommended to carry out socio-economic status of household in Shan Ka Lay Kyun Village after five years or more, factors affecting the poverty level on flooded area and job opportunities for households. If other important factors are studied as the factors of poverty level, the results will be more interested.

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APPENDIX (A)

QUESTIONNAIRE

FACTORS AFFECTING ON POVERTY OF HOUSEHOLDS IN FLOODED AREA OF SHAN KA LAY KYUN VILLAGE, AMARAPURA TOWNSHIP

Date ……..... Questionnaire No. ……

1. Address

   Township…… Village……

2. Respondent

   (a) Name…… (b) Age ……

   (c) Male/Female……. (d) Education…….

   (e) Occupation……. (f) Kinship with householder……

3. Head of Household

   (a) Name……. (b) Age…… (c) Male/Female……

   (d) Education…… (e) Occupation……

4. Family Topics

   (a) Number of family

Sir No.	Name	Gender	Religion	Relation with Household Head	Age	The Highest Level of Education	Marital Status	Occupation	Income

   (b) Number of Students

Level of Education	No. of Students		Age	Total
	Male	Female		
Primary				
Middle				
High				
University				

Total				

5. When Cultivation/Farming

(a) (1) land owner ☐ (2) tenant ☐ (3) lease ☐ (4) Others ☐

6. Properties of Sample Households

(a) Car ☐ (b)Mini Oway ☐ (c) Cycle ☐

(d) Bicycle ☐ (e)Tricycle ☐ (f) Tricar ☐

(g) Horse-drawn ☐ (h) Boat ☐ (i) TV,VCD ☐

(j) Telephone ☐ (k) Rice Cooker ☐ (l)Refrigerator ☐

(m) Sewing machine ☐ (n)Gas, Stove ☐ (o) Radio, Cassette ☐

(p) Others ☐

7. Expenditure

No.	Type of Expenditure				Expenses (kyats)		
					One week	One month	One year
1.	Expenses for kitchen		Price	Amount			
	1.	Rice					
	2.	Oil					
	3.	Market (one week)					
2.	Fruits/Beverages						
3.	Education		School fees, Book				
4.	Repair Cost		Home/Car/Cycle/Boat/Bicycle				
5.	Recreation		Vacation/Pilgrim/ Movies/ TV				
6.	Social Cost		Compassionate/ Donation				
7.	Health Cost		Man/ Children				
8.	General Expenses		Shoe/Cloth/Phone				
Total							

8. Did you get loan? □ Yes □ No

If you get loan; describe detail

Name of organization	Amount of loan	Interest	Reason of getting loan	Period

(a)Does income support by getting loan? □ Yes □ No

If not support; please tick the following:

Less amount	High interest rate	Short loan period	Not use with correctly

9. Housing Condition

(a) □ Own (b) Rent □ (c) Others □

Please tick				
Housing Type	R.C	Brick	Wooden	Bamboo
Housing Type (Height)	One Floor	Two Floors	Long Legs	
Toilet Type	Open pit Toilet	Simple Toilet	No	
Number of Toilets				

10. Distance Condition

Distance	Near	Far
School from home		
Shop from home		
Clinic from home		
Hospital from home		

11. Drinking Water

Please tick	Purified Water	Well	Tube well	River	Lake	Others
Regular Time						
Tide Time						

12. Condition of Cooking

Please tick	Electricity	Wooden	Charcoal	Gas	Others
Regular Time					
Tide Time					

13. Energy Condition

Please tick	Electricity	Battery	Solar	Generator	Others
Regular Time					
Tide Time					

14. Garbage System

Please tick	Dust-cart/dustbin	Fire/Underground	River	No Stable	Others
Regular Time					
Tide Time					

15. Please tick the box below to check for the following effects of flooding:

(a)

Length of Stay in this place	Time of high tide	Number and duration of floods	The remaining household members after a flood

(b) Please tell us why you like your current location.

(c) The place where people live in case of flood

i. Upstairs
ii. Near the road
iii. Monastery
iv. Others

(d) What are the preparations for a flood?

APPENDIX (B)

REGRESSION

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.750[a]	.562	.556	81255.424

a. Predictors: (Constant), No. of student, Total Income, live time, Family size

b. Dependent Variable: Total Expenses

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2503117705116.214	4	625779426279.054	94.780	.000[b]
	Residual	1947720958322.449	295	6602443926.517		
	Total	4450838663438.663	299			

a. Dependent Variable: Total Expenses

b. Predictors: (Constant), No. of student, Total Income, length of stay, Family size

Coefficients[a]

Model		Unstandardized Coefficients		Standardiz-ed Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	65281.385	20978.302		3.112	0.002		
	Total income	0.374	0.019	0.744	19.277	0.000	0.995	1.005
	Length of Stay	321.380	368.138	0.034	0.873	0.083	0.954	1.048
	Family size	2645.193	3234.475	0.037	0.818	0.014	0.735	1.361
	Number of student	-3066.288	5724.861	-0.024	-0.536	0.093	0.726	1.377

a. Dependent Variable: Total Expenses

FACTOR ANALYSIS

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.572
Bartlett's Test of Sphericity	Approx. Chi-Square	156.071
	Df	55
	Sig.	0.000

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.469	13.353	13.353	1.380	12.546	12.546
2	1.422	12.923	26.276	1.369	12.449	24.995
3	1.285	11.682	37.958	1.281	11.643	36.638
4	1.191	10.829	48.787	1.243	11.301	47.939
5	1.070	9.728	58.515	1.163	10.575	58.515
6	.967	8.787	67.302			
7	.897	8.150	75.452			
8	.787	7.150	82.603			
9	.762	6.932	89.534			
10	.588	5.346	94.880			
11	.563	5.120	100.000			

Extraction Method: Principal Component Analysis

LOGISTIC REGRESSION

Omnibus Tests of Model Coefficients

		Chi-square	Df	Sig.
Step 1	Step	89.126	7	0.000
	Block	89.126	7	0.000
	Model	89.126	7	0.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	211.115[a]	.257	.406

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	13.172	8	.106

Percentile Group of Wealth

	Wealth Index	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poorest	63	21.0	21.0	21.0
	Poor	60	20.0	20.0	41.0
	Middle	60	20.0	20.0	61.0
	Rich	60	20.0	20.0	81.0
	Richest	57	19.0	19.0	100.0
	Total	300	100.0		

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Occupation (1)	-0.527	0.449	1.377	1	0.041	.590
	Loans	0.281	0.666	0.178	1	0.673	1.325
	Total income	0.000	0.000	46.477	1	0.000	1.000
	Age	0.000	0.014	0.001	1	0.973	1.000
	Gender (1)	-0.157	0.521	0.091	1	0.763	0.855
	Family size	-0.098	0.121	0.655	1	0.418	0.907
	No. of student	-0.088	0.217	0.165	1	0.684	0.916
	Constant	-3.648	0.996	13.413	1	0.000	0.026

a. Variable(s) entered on step 1: Occupation, Loans, Total Income, Age, Gender, Family size, No. of student