YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

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DEMOGRAPHIC AND SOCIO-ECONOMIC EFFECTS OF POVERTY IN HLAING THAYAR TOWNSHIP

THAN HTIKE SOE

MAS – 1

MAS 2nd BATCH

JULY, 2022

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This thesis is submitted to the Board of Examination as partial fulfillment of the requirements for the Degree of Master of Applied Statistics

Approved by Board of Examiners

Supervised by:

Daw Hla Hla Aye
Associate Professor
Department of Statistics
Yangon University of Economics

Submitted by:

Than Htike Soe
MAS - 1
MAS 2nd Batch
Yangon University of Economics

JULY, 2022

ACCEPTANCE

Accepted by the Board of Examiners of the Department of Statistics, Yangon University of Economics in partial fulfillment for the requirement of the Master Degree, Master of Applied Statistics.

.....…….

(Chairperson)

Professor Dr. Mya Thandar

Pro-Rector

Yangon University of Economics

……	…….
(External Examiner)	(Chief Examiner)
Dr. Swe Swe Zin	Dr. Aye Thida
Professor and Head	Professor and Head
Department of Shipping Management	Department of Statistics
Myanmar Maritime University	Yangon University of Economics

……	…….
(Internal Examiner)	(Supervisor)
Dr. Sanda Thein	Daw Hla Hla Aye
Professor	Associate Professor
Department of Statistics	Department of Statistics
Yangon University of Economics	Yangon University of Economics

JULY, 2022

ABSTRACT

This study aims at exploring determinants of poverty in Hlaing Tharyar Township. The secondary data used in this study are obtained from the 2014 Myanmar Population and Housing Census. Then, the background characteristics of this township based on 2014 Myanmar Population and Housing Census are presented in this study. There were a total of 11339 household heads and among them, 4565 were poor. Descriptive statistics, Pearson's Chi-square test and Binary Logistic Regression model were applied to detect determinants of poverty. Based on the findings, it can be seen that the percentage of poor male-headed households was more than that of female-headed households in this township. Moreover, there was a higher percentage of poor household heads aged 25-34 years in compared to other age groups. Likewise, the highest percentages of poor household heads are married. Most of the poor household heads have been employed in private and secondary industrial sector. Additionally the results of both association test and binary logistic regression analysis confirmed that poverty was related to gender, marital status, educational level, occupational status and industrial sector. It is also found that age and educational level were negatively correlated to the level of poverty. Therefore, it is suggested that the policy makers need to emphasize the sustainable development of education sector and to create job opportunities for those people who live in Hlaing Tharyar Township in order to decrease its poverty level.

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LIST OF ABBREVIATIONS

CI	Confidence Interval
DHS	Demographic and Health Surveys
DOP	Department of Population
HDI	Human Development Index
HVS	Household Vulnerability Survey
MDGs	Millennium Development Goals
MLCS	Myanmar Living Conditions Survey
MPI	Multidimensional Poverty Index
OPHI	Oxford Poverty and Human Development Initiative
OR	Odd Ratio
PCA	Principal Component Analysis
SDGs	Sustainable Development Goals
SES	Socio-Economic Status
UN	United Nations
UNDP	United Nations Development Programme
WB	World Bank
WI	Wealth Index

CHAPTER I
INTRODUCTION

The poverty issue of a nation has remained a big challenge since human civilization. Everywhere, battling against poverty is accepting as an increasingly more focal job and monetary and social changes have caused a reestablished interest in this arena. The subject of destitution has been on the plan for nations worldwide for a long time. For instance, in 2000, the members of the United Nations (UN) tended to give more emphasis on outrageous destitution through establishing as one of the Millennium Development Goals (MDGs). Besides, in 2015, UN member nations declared the Sustainable Development Goals (SDGs), which set even more accentuation on destroying outrageous worldwide poverty by 2030. Accordingly, Goal 1.1 of the SDGs is targeted at eradication of extreme poverty by 2030 (World Bank, 2016).

A measure of the socio-economic status (SES) of families is a critical component in most economic and demographic analysis. This measure is useful tool in assessing poverty and disparity of a population. In addition, it can be utilized as a control variable in estimating the impact of other variables related to wealth (Filmer & Pritchett, 2001).

Demographic factors are essential to examine family poverty and these may likewise effect of the financial development of a nation. The nations having high fertility rates and low child mortality rate cause a high youth dependency rate, which brings down the per-capita assets for contribution in human resources, infrastructure, and economic development. In these conditions, it is difficult for families to handle the issues emerging from poverty. Financial development and family hardship are affected by adult mortality rates. Because of extreme and lethal sickness, terrorism and armed conflicts, the working age populace of the nation declines which upsurges the rate of poverty at family level as well as entirely at national level by raising age dependency burdens and diminishing the potential for financial development (Buvinic et al., 2009).

Asset ownership provides an explanation of the long-term financial status of a family, and however it has less impact on short-term economic changes in contrast with other wealth or poverty measures. The wealth index (WI) estimates relative wealth and, dissimilar to the poverty line, is not an absolute measure of poverty or wealth. The wealth of families based on the wealth index to rank from poorer to wealthier households can be estimated but this can't permit to make sense of who is extremely poor and wealthy. The wealth quintiles divide the entire population into five equally huge groups, based on their wealth rank. It permits the researchers to distinguish the effect of wealth on poverty outcomes (Bottone et al., 2017).

1.1 Rationale of the Study

In Myanmar, poverty is estimated at 24.8 percent of the population is below the national poverty line in 2017 based on Myanmar living conditions survey (MLCS) 2017 released by the Ministry of Planning, Finance and Industry. The national poverty line in 2017 is 1,590 kyats 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. A household is considered to be poor if its per adult equivalent level of consumption 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 he or she lives in a household with consumption per adult equivalent per day of 1,590 kyat or less. According to the Myanmar living conditions survey 2017, World Bank reported that one in four people is poor and the number of poor people resident in rural areas is 6.7 times as high as in urban areas. Many households were living marginally above the poverty line and remained vulnerable to falling below it. More specifically, about a third of the total population in Myanmar (32.9 percent) was considered as near poor in 2017.

Until August 2020, Myanmar had the lowest coronavirus infection rate in the East Asia and Pacific Region. However, the series of regulations and alleviation measures established by the public authorities since February 2020 managed to control the spread of the infection, which prompted disturbances in business operations. Retail shops as well as manufacturing firms experienced broad supply chain disruptions, bringing some areas of the economy and trade came to a halt.

As indicated by the after-effect of Extreme Poverty in Yangon Report (2017), the population living in poverty in Yangon Region is estimated at 2.4 million out of 7.3 million of the region's total population. The urban poor households seem to have highly dependent family members and low incomes. The poorest families are usually composed of irregular and unskilled workers. Most common unskilled jobs are casual laboring, vendor, trishaw driver, salesperson, bricklayer, garment factory staff, company staff, carpenter, laundress and mason.

Hlaing Thayar Township, one of the biggest and most populated townships, is located in the western part of the Yangon Region. According to the report of Save the Children International (2017), Hlaing Thayar Urban Household Economy Assessment, 2013 showed that 40% of households living in this township are under the World Bank international extreme poverty line of 1.25 USD per person per day. Hlaing Thayar Township is a peri-urban area where there is a large disparity in income between different households with distinct wealth level. The households with upper and middle income level have a variety of income sources including their own shops, a government salary or income from skilled labour, and some have an additional income source from property or vehicle rental. The poorest households, on the other hand, are limited to irregular and unskilled labour. For men and boys, there were construction works or other labouring jobs without a contract, and women and girls also engaged in similar unskilled laboring jobs such as loading/unloading, laundry and domestic work or small-scale petty trade. Nowadays, Hlaing Thayar Township became a magnet for rural migrants seeking new job opportunities and regular income. Thus, it is needed to find out what demographic and socio-economic factors are influencing the households' poverty and consequently the government can be able to take necessary action for reducing the poverty in this township. For these reasons, the poverty situation and its concomitant determinants in Hlaing Thayar Township of Yangon Region will be investigated in this study.

1.2 Objectives of the Study

The objectives of the study are:

(i) to identify the demographic and socio-economic characteristics in Hlaing Thayar Township

(ii) to examine the association between poverty and demographic and socio-economic characteristics in Hlaing Thayar Township

(iii) to explore the factors affecting the poverty in Hlaing Thayar Township.

1.3 Method of Study

The data used in this study is secondary data from the 2014 Myanmar Population and Housing Census of the Department of Population (DOP). Descriptive statistics were used to describe the demographic and socio-economic characteristics of the head of households in Hlaing Thayar Township. Pearson's Chi-square test was applied to examine the association between poverty and demographic and socio-economic characteristics. Binary logistic regression model was used to identify the demographic and socio-economic determinants of poverty. This study also includes the Principal Component Analysis (PCA) to construct the wealth quintile based on the data of asset ownership, water source and sanitation, and housing materials.

1.4 Scope and Limitations of the Study

In this study, the secondary data collected from the 2014 Myanmar Population and Housing Census conducted by the Department of Population under the Ministry of Labour, Immigration and Population of the Republic of the Union of Myanmar were used. The unit of analysis that was employed in this study is the household heads of selected individuals of Hlaing Thayar Township from Census data. Moreover, this study is only focused on the households which have a household head at the working aged between 15 and 64 years. In such reason, the study used ten percent of the total households of the Hlaing Thayar Township as a sample. In addition, the wealth index based on asset ownership is used to describe the poverty level in this study.

1.5 Organization of the Study

This study is composed of five chapters. Chapter I provides rationale and it also briefly explains the method of the study and its scope and limitations. The rest of the chapter is organized as follows. Chapter II discusses a literature review on poverty. Chapter III explains the research methodology. Chapter IV provides the major determinants of poverty and Chapter V represents the conclusion of the study.

CHAPTER II
LITERATURE REVIEW

This chapter describes the overview of poverty, previous studies on the poverty situation and the analytical framework of the study.

2.1 Overview of Poverty

Poverty can be characterized in economic terms by being a nation, area or family that is poor when the per capita income of a nation or the income of a family is exceptionally low. In political terms, a nation, an area or a group of people are poor, who are dependent on more remarkable groups or individuals to communicate their own freedoms or decisions. In social terms, the manifestation of poverty is revealed when a nation, area or family breeds a wide range of socially unacceptable behaviors, like chronic drug use, crime, prostitution, violence in a family or in a community and psychological warfare, all of which corrupt human dignity, moral and social values of the society as a whole, when an ever increasing number of individuals in the community become narrow minded of one another and are impolite towards one another in their everyday life.

Throughout many recent years, different hypothetical methodologies have been proposed to understand the reasons for poverty, and those approaches can be gathered into three classifications: macro or structural level, micro or individual level and contextual or neighborhood level. The structural-level point of view takes the dysfunctional economic, political and social systems which prompt individuals to have restricted opportunities and resources. The individual-level approach holds that poverty is inferable from individual characteristics and ways of behaving. The neighborhood or contextual level point of view, in any case, treats poverty not only as a result of individual attributes, but also as the consequence of neighborhood influences. That is, people’s place of residence influences their possibilities of social versatility.

Poverty can be defined as absolute deprivation or relative deprivation. The absolute approach views poverty as the inability to meet fundamental human needs

such as food, warmth and shelter. The relative approach sees poverty in terms of the minimum acceptable standards of living in comparison with other people within the society in which a particular person lives (United Nations, 1995). Absolute poverty is widely used by developing countries where the basic needs are not met by many people, while relative poverty is more suitable for middle and high income countries (UNDP, 2015).

In the annual World Development Report (World Bank, 1990), the measure of "1 Dollar a Day" was introduced. The aim was to quantify extreme monetary poverty in a measure that was easily translated between countries. The measure of 1$ per day is based on purchasing power parity; a person is deemed extremely poor if they do not have the ability to buy a basket of goods equivalent to one US dollar. It was later adopted as a Millennium Development Goal to reduce the prevalence of monetary poverty by half (United Nations, 2013), and the measure is still widely used today as a measure of extreme poverty and deprivation. It has over time been updated to 1.25$ in 2005 and 1.9$ in 2015 (World Bank, 2015a).

The Human Development Index (HDI) was introduced in the 1990s to also account for educational attainment and health (UNDP, 1990). In 2010, the Multidimensional Poverty Index (MPI) was presented and includes ten indicators within three dimensions and a measurement of the intensity of poverty, given that one is defined as poor. If one is deprived of 30 percent or more of the selected indicators, one is considered to be multidimensional poor (OPHI, 2010). The intensity of poverty is defined as the "proportion of the weighted component indicators in which, on average, poor people are deprived" (UNDP, 2016).

Economic poverty doesn't be guaranteed to reflect weakness to mortality or intense affliction, but rather the degree of inequality in a given setting. Human poverty is characterized by impoverishment in different aspects hardships in a long and sound life, in information, in a decent standard of living, in interest. Human poverty adopts a group focused strategy by guiding assets and focusing on areas of individual capacity building such as health and education. Multidimensional poverty imagines hardship as absence of material products, yet additionally as lack in other significant areas such as social capital, resources, power, and voice. According to a study by the World Bank, the poor are more likely to describe their reality in terms of physical, human, social, and environmental assets rather than income (Mowafi & Khawaja, 2005).

2.2 Reviews on Related Studies of Poverty Situation

Numerous empirical studies have endeavored to identify various determinants of poverty. Socio-demographic factors and geographical factors such as household size, education attainment, gender, age and employment status of household head, household asset ownership (i.e. landholding) and spatial factors have been identified as factors that influence poverty.

According to the Household Vulnerability Survey (HVS) 2020, the majority of Myanmar households (83.3 percent) reported a drop in income, with an average year-by-year reduction of 46.5 percent between 2019 and 2020. Non-farm household businesses (market sellers, hairdressers, and tailors) expressed the biggest drop in personal income. While cultivation has likewise been hit by COVID-19 limitations, the impact has been rather lower as seasonal farming activities have ended. Domestic remittance has also declined, as there was a decrease in the number of families with a member working in a different state/region. In March 2020, 9.4 percent of poor households had a family member working in another state/region. By September/October 2020, that number had dropped to 6.8 percent. While 7.1 percent of families had relatives working abroad before March 2020, which has dropped to 5.0 percent since the COVID-19 limitations were forced.

Rodriguez (2000) examined the changes in poverty in Mexico in 1996 based on the National Survey of Income and Expenditures of Households for the years 1994 and 1996 by estimating the Foster-Greer-Thorbecke family of poverty measures. The poverty profiles were constructed for both years, indicating that poverty incidence is higher for households located in rural areas, for large households, for households where the head has a low level of education and for households whose head works in a rural or domestic occupation. A logistic regression model was estimated for 1996, with the probability of a household being extremely poor as the dependent variable and a set of economic and demographic variables as the explanatory variables. Findings showed that the variables that are positively correlated with the probability of being poor are size of the household, living in a rural area, working in a rural occupation and being a domestic worker. Variables that are negatively correlated with the probability of being poor are the education level of the household head, age and works in a professional or middle level occupation.

Awan and Iqbal (2010) used a survey to examine the determinants of urban poverty in Sargodha, a medium-sized city of Pakistan, based upon primary data at household level. The information is taken through randomly selecting 11 union councils and interviewing 30 households at random in each selected union council based on the factors including income of the household, expenditure of household on food items, fuel and utilities, housing, frequent non-food expenses and other non-food expenses like clothes, footwear, education, and health related expenses. The study employs a binomial logistic regression model to measure the effect of predictor variables of demographic, human capital and dwelling endowment. The findings in this study showed employment in the public sector, investment in human capital and access to public amenities reduce poverty, while employment in the informal sector, greater household size and female-dominated households increase poverty.

Osowole et al. (2012) elaborated a logistic regression modelling to identify the possible determinants of poverty status of households in Nigeria by using the 2003/2004 National Living Standard Survey (NLSS) data. The results showed that household size and educational group for the highest level attained by the household head were the most significant determinants of poverty and the others include sex of the household head, age in years of the household head, father's education level, father's work, mother's work, and occupation group of the household head.

Habyarimana et al. (2015) analyzed the demographic and health survey to measure poverty of households in Rwanda by using principal component analysis in order to create the asset index based on the Rwanda Demographic Health Survey (RDHS) (2010) data with applied a logistic regression analysis of the socio-economic status (SES) as response variable and the demographic characteristics of the household as explanatory variables. Findings revealed that the age of the household head, education level of the household head, gender of the household head, place of residence, the province of the household head and size of the household (number of household members) were the significant predictors of poverty of the household in Rwanda.

Ambros and Saxena (2018) proposed the logistic regression approach for the determinants of acute poverty at household level in Tanzania. This paper aimed to establish the factors that increase the risk of poverty as well as to estimate the extent to which households are threatened by this phenomenon and to estimate and compare poverty spheres in a regional approach by means of the most important poverty

indicators, by using socioeconomic aspects of poverty with reference to Tanzania. The data used in this study was secondary data from national panel survey data in 2014/15 of Tanzania. In this study, a logistic regression technique was used and the predictor variables were the socio-economic and demographic characteristics of the household head and household's characteristics, such as education level attained by the head, marital status, sex, age and employment status, household's place of residence, household's size and household's main source of livelihood income to associate with the household poverty status which were either poor or non-poor. The finding showed that the education level, marital status and employment status of the household' head were significantly associated with poverty. The household's place of residence, main source of livelihood income and the size of the household also have a significant effect on the determination of acute poverty.

Peng et al. (2019) studied determinants of poverty and their variation across the poverty spectrum: Evidence from Hong Kong, a high-income society with a high poverty level, by using a quantile regression model to examine the differential effects of poverty across the poverty spectrum based on secondary dataset from Hong Kong Panel Survey for Poverty Alleviation. The study was analyzed using logistic regression and the results indicated that being elderly, being female, not having a partner, from a single-parent household, not being employed, living in public rental housing, having lower education attainment, and having poor self-rated health are increased the probability of being poor.

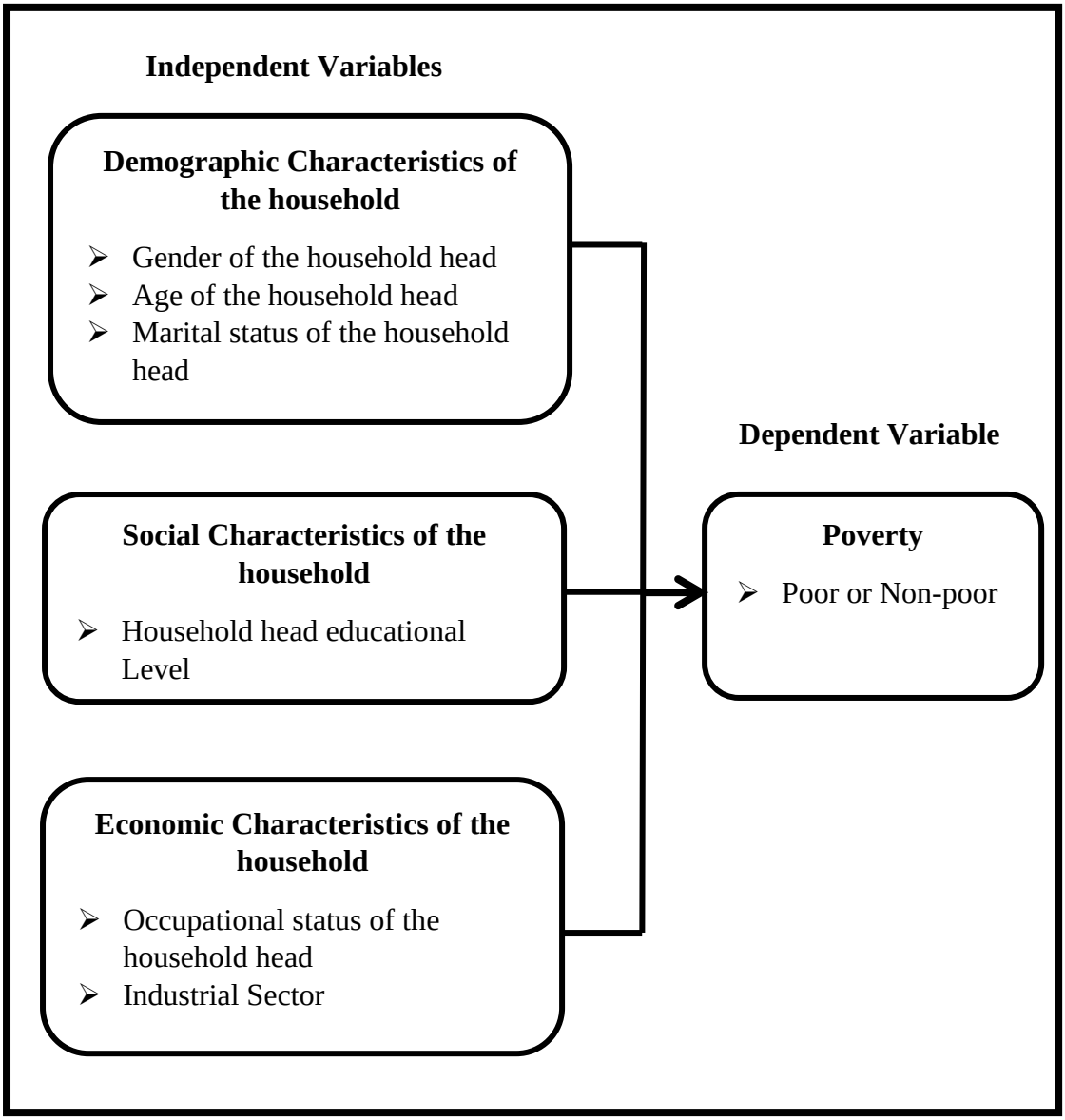
Shunn Lei Yee Aung (2021) explored the factors associated with poverty in Dagon (Seikkan), North Okkalapa and Shwe Pyi Tha Townships based upon secondary data from the 2014 Myanmar Population and Housing Census. In this study, a binary logistic regression model was used. Findings revealed that age, education and marital status of household heads in Dagon Myothit (Seikkan) Township were significant associations with poverty. In North Okkalapa Township, only two variables such as age and education of household head were significantly associated with poverty and also sex, age, marital status and education of household head were significant determinants of poverty in Shwe Pyi Tha Township. In all three townships, the common factors having statistically significant association with poverty were education and age of household heads.

Sugiharti et al. (2022) determined the chronicity of poverty in Indonesia using the equally distributed equivalent (EDE) poverty gap method, based on Indonesian

Family Life Survey (IFLS), tracing Indonesian households in two survey periods, 2007 and 2014. The study was analyzed using a quantile regression approach. The results found that age, gender, employment status, education, large household size, having no access to services (finance, electricity, information, and mobility), and having limited or no assets were significant factors of chronicity. In addition, casual employment in the agricultural sector and living in rural areas increase the probability of poverty, although not necessarily chronic.

2.3 Analytical Framework

Based on the determinants of poverty level in previous studies, the following analytical framework was constructed (Figure 2.1). This study focuses on poverty affected by the demographic and socio-economic characteristics of household heads. Gender, Age, Marital Status, Educational Level, Occupation Status and Industrial Sector of household heads are used as independent variables and poverty as dependent variable.



Source: Own Compilation

Figure (2.1) Analytical Framework of Poverty

CHAPTER III
RESEARCH METHODOLOGY

In this chapter, Data Sources, Profile of Hlaing Thayar Township, the methodology of Principal Component Analysis (PCA), Binary logistic regression model, the likelihood ratio test, Chi-square goodness of fit tests, Hosmer-Lemeshow test, Cox and Snell R-square, Wald Statistic, Pearson's Chi-squared test and description of variables were used to analyze poverty situation in this study are presented.

3.1 Data Source

In this study, the secondary data of sampled individuals for Hlaing Thayar Township was collected from the 2014 Myanmar Population and Housing Census conducted by the Department of Population under the Ministry of Labour, Immigration and Population of the Republic of the Union of Myanmar. The poverty level of the working age population of 11339 household heads from Hlaing Thayar Township Census data was studied.

3.2 Profile of Hlaing Thayar Township

Hlaing Thayar Township is one of the townships located in the northern district of the Yangon Region. It shares borders with Htantabin township to the west, Insein township to the east, Shwe Pyi Thar to the north and Twan Tay township to the south. This township comprises 20 wards and 9 village tracts. The area of the township is 42.64 square kilometers. Insein township and Hlaing Thayar Township are separated by the Hlaing River. Aung Zaya Bridge and Bayint Naung Bridge are very useful bridges for Hlaing Thayar residents. There are many industries, a so-called Hlaing Thayar Industrial Zone which creates many job opportunities for the residents and people from other local areas. This township possesses a "Dagon-Ayeyar" highway bus station connected with the Ayeyawady Division. According to the 2014 census report, there are 687867 people in this township, separately 322862

(47%) males and 365005 (53%) females. Out of the population, 70.1 percent live in urban area and 29.9 percent live in rural area. It has 148711 households and the average of 4.5 people living in each household in this township. The density of population in this township is 10,210.6 people per squared kilometer.

As a demographic characteristic of Hlaing Thayar Township, the sex ratio was 89 males per 100 females. Regarding the percentages of population by age group 24% was children (0-14 years), 72.8% was economically productive people aged 15-64 years and 3.2% was elderly persons (over 65) respectively. In dependency ratios, there were about 33 child-dependents per 100 working people aged 15-64 and also the old-age dependents were 4 per 100 persons at productive working age. Moreover, there were 37 total dependents per 100 working people in Hlaing Thayar Township.

Furthermore, the literacy rate of people aged 15 and over in Hlaing Thayar Township was 96.8%. In more detail, the literacy rate of females and males were 95.6% and 98.2% respectively.

In addition, as an economic characteristic of Hlaing Thayar Township, it can be seen that the labour force participation rate of the population in the working age group (15-64) was 68.9%. The labour force participation rate of males was 86.8% and females was 53.6% respectively. The unemployment rate of people at the working age was 2.4%. The unemployment rate of males at the working age was 2.7% and that of females was 1.9% respectively.

3.3 Principal Component Analysis (PCA)

A principle component analysis is concerned with explaining the variance-covariance structure of a set of variables through a few linear combinations of these variables. It general objectives are data reduction and interpretation.

Although p components are required to reproduce the total system variability, often much of this variability can be accounted for by a small number k of the principle components. If so, there is as much information in the k components as there is in the original p variables. The k principal components can then replace the initial p variables, is reduced to a data set consisting of n measurement on k principal components.

An analysis of principal components often reveals relationships that were not previously suspected and thereby allows interpretations that would not ordinarily results.

Algebraically, principal components are particular linear combinations of the p random variables X_1, X_2, …, X_p. Geometrically, this linear combination represent the selection of a new coordinate system obtained by rotating the original system with X_1, X_2, …, X_p. as the coordinate axes. The new axes represent the directions with maximum variability and provide a simpler and more parsimonious description of the covariance structure.

Principal components depend solely on the covariance matrix $\sum$ (or the correlation matrix P) of $X_1, X_2, \ldots, X_p$. Their development does not require a multivariate normal assumption. On the other hand, principal components derived for multivariate normal populations have useful interpretations in terms of the constant density ellipsoids.

Let the random vector $X' = [X_1, X_2, \ldots, X_p]$ have the covariance matrix $\sum$ with eigenvalues $\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_p \geq 0$.

Consider the linear combinations

$$
\begin{aligned}
Y_1 &= a_1' X = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1p}X_p \\
Y_2 &= a_2' X = a_{21}X_1 + a_{22}X_2 + \cdots + a_{2p}X_p \\
&\vdots \\
Y_p &= a_p' X = a_{p1}X_1 + a_{p2}X_p + \cdots + a_{pp}X_p
\end{aligned}
\qquad (3.1)
$$

Then, it obtain

$$\text{Var}\ (Y_i) = a_i' \sum a_i \qquad i = 1,2,\ldots, p \tag{3.2}$$

$$\text{Cov}\ (Y_i, Y_k) = a_i' \sum a_k \qquad i, k = 1,2,\ldots, p \tag{3.3}$$

The principal components are those uncorrelated linear combinations $Y_1, Y_2, \ldots, Y_p$ whose variances in (3.1) are as large as possible.

The first principal component is the linear combination with maximum variance. That is, it maximizes $\text{Var}(Y_1) = a_1' \sum a_1$. It is clear that $\text{Var}\ (Y_1) = a_1' \sum a_1$ can be increased by multiplying any a_1 by some constant. To eliminate this indeterminacy, it is convenient to restrict attention to coefficient vector of unit length. It can define

First principal component = linear combination $a_1'X$ that maximizes
Var ($a_1'X$) subject to $a_1'a_1 = 1$

Second principal component = linear combination $a_2'X$ that maximizes
Var ($a_2'X$) subject to $a_2'a_2 = 1$and
Cov $(a_1'X, a_2'X) = 0$

At the i[th] step,

i[th] principal component = linear combination $a_i'X$ that maximizes
Var ($a_i'X$) subject to $a_i'a_i = 1$and
Cov $(a_i'X, a_k'X) = 0$ for k < i

3.4 Pearson's Chi-squared Test

Pearson's Chi-squared test (χ^2) is a statistical test applied to test a null hypothesis stating that the frequency distribution of certain events observed in a sample is consistent with a particular theoretical distribution. The events considered must be mutually exclusive and have total probability 1. A common case for this is where the events each cover an outcome of a categorical variable.

The test-statistic is

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \tag{3.4}$$

where, χ^2 = Pearson's cumulative test statistic, which asymptotically approaches a χ^2 distribution

O_i = the number of observations of type i

E_i = the expected (theoretical) count of type i

3.5 Binary Logistic Regression Model

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. The dependent variable in logistic regression is usually dichotomous, that is the dependent variable can take value 1 with a probability of success, P(Y=1) = π, or the value 0 with the probability of failure P(Y=0) = $1 - \pi$. The use of linear regression model for categorical variables was considered as inappropriate because the response values are not measured (ratio scale or quantitative values) and the error terms are not normally distributed (Rastogi & Singh, 2019). The major limitation of linear regression is that it cannot fit with the dependent variables that are categorical or dichotomous. Logistic regression assesses the impact of multiple independent variables simultaneously at a time on the categorical dependent variable.

The binary logistic regression model in the usual form is

$$Y_i = E(Y_i) + \varepsilon_i \tag{3.5}$$

For a binary dependent or response variable 'Y' and an independent or predictor variable 'X', the probability for the distribution of 'Y' can be written as:

$$P(Y = 1) = \pi$$

$$P(Y = 0) = 1 - \pi$$

The logistic regression model is therefore given as,

$$\pi_i = \frac{\exp(\sum_{j=1}^{p} \beta_j X_{ij})}{1 + \exp(\sum_{j=1}^{p} \beta_j X_{ij})} \tag{3.6}$$

Therefore, Equation (3.5) can be written as

$$\pi(X) = \frac{e^{\beta_0 + \beta_1 X}}{1 + e^{\beta_0 + \beta_1 X}} \tag{3.7}$$

Equation (3.6) determines the binary logistic regression for a single independent variable. Here, the two regression constraints viz. the intercept, β_0, and the regression parameter for X, β_1, set the basis of the above mentioned model.

For a binary response variable 'Y', having 'k' number of independent variables ($X_1, X_2,\ldots, X_k$); π(X) is used to represent the probability that Y=1 for having event and 1- π(X) to represent the probability of not having event (Y=0).

These probabilities are written as

$\pi(X) = P(Y = 1|\, X_1\,,\, X_2\,, \ldots,\, X_k\,)$

$1 - \pi(X) = P(Y = 0|\, X_1\,,\, X_2\,, \ldots,\, X_k\,)$

Since the distribution of the error term ε_i depends on the Bernoulli distribution of the response Y_i. The expected value of each Y_i is

$$E(Y_i) = \pi_i = \frac{\exp(\beta_0 + \beta_1 X_1 + \cdots + \beta_i X_i)}{1 + \exp(\beta_0 + \beta_1 X_1 + \cdots + \beta_i X_i)} \tag{3.8}$$

where, $E(Y_i)$ = conditional mean given the value of X_i

β_0 = the constant of the equation

β_i = the coefficient if the predictor variable i

An alternative form of the logistic regression equation is:

$$\log[\,\pi(X)] = \log\left[\frac{\pi_i}{1-\pi_i}\right] = \beta_0 + \beta_1 X_1 + \cdots + \beta_i X_i \tag{3.9}$$

Odds Ratio

An Odds Ratio (OR) is a measure of association between a certain property A and a second property B in a population. Specifically, it tells how the presence or absence of property A has an effect on the presence or absence of property B. The OR is also used to figure out if a particular exposure (like eating processed meat) is a risk factor for a particular outcome (such as colon cancer), and to compare the various risk factors for that outcome.

The formula of odd ratio can be written as

$$OR = \frac{odds(A)}{odds(B)} = \frac{\frac{P_A}{(1-P_A)}}{\frac{P_B}{(1-P_B)}} \tag{3.10}$$

The regression coefficient is the estimated increase in the log odds of the outcome per unit increase in the value of the exposure. An odds ratio > 1 suggests an increasing probability of being in a higher level on the dependent variable as values on an independent variable increases, whereas a ratio < 1 suggests a decreasing probability with increasing values on an independent variable. An odds ratio = 1 suggests no predicted change in the likelihood of being in a higher category as values on an independent variable increases. A multiple logistic regression model can be fitted with a binary response variable (Y) and a binary predictor variable (X), and in addition other predictor variables $Z_1,\ldots,Z_k$ that may or may not be binary. If a multiple logistic regression was used to regress Y on X, $Z_1,\ldots,Z_k$, then the estimated coefficient β_x for X is related to a conditional OR. Specifically, at the population level

$$e^{\hat{\beta}_x} = \frac{P(Y=1|X=1,Z_1,\ldots,Z_k)/P(Y=0|X=1,Z_1,\ldots,Z_k)}{P(Y=1|X=0,Z_1,\ldots,Z_k)/P(Y=0|X=0,Z_1,\ldots,Z_k)} \tag{3.11}$$

where, $e^{\widehat{\beta}x}$ is an estimate of this conditional odds ratio. The interpretation of $e^{\widehat{\beta}x}$ is as an estimate of the OR between Y and X when the values of $Z_1, \ldots, Z_k$ are held fixed.

3.6 Evaluation of Logistic Regression Model

After estimating the coefficients, there are various evaluation parameters or test need to be conducted for assessing the appropriateness, usefulness and adequacy of the developed logistic regression model. These evaluation parameters are the statistical test of each predictor variable and goodness-of-fit statistics.

3.6.1 The Likelihood Ratio Test

Overall fit of a model shows how strong a relationship between all of the independent variables, taken together, and dependent variables. It can be assessed by comparing the fit of the two models with and without the independent variables. A logistic regression model with the k independent variables (the given model) is said to provide a better fit to the data if it demonstrates an improvement over the model with

no independent variables (the null model). The overall fit of the model with k coefficients can be examined via a likelihood ratio test which tests the null hypothesis

$$H_0 = \beta_1 = \beta_2 = ... = \beta_k = 0.$$

To do this, the deviance with just the intercept (-2 log likelihood of the null model) is compared to the deviance when the k independent variables have been added (-2 log likelihood of the given model). Likelihood of the null model is the likelihood of obtaining the observation if the independent variables had no effect on the outcome. Likelihood of the given model is the likelihood of obtaining the observations with all independent variables incorporated in the model.

The difference of these two yields a goodness of fit index $G = \chi^2$ statistic with k degrees of freedom (Bewick et al., 2005). This is a measure of how well all of the independent variables affect the outcome or dependent variable.

G = χ^2 = (-2 log likelihood of null model) - (-2 log likelihood of given model)

An equivalent formula sometimes presented in the literature is

$$= -2 \log \frac{likelihood\ of\ the\ null \bmod el}{likelihood\ of\ the\ given \bmod el}$$

Where; the ratio of the maximum likelihood is calculated before taking the natural logarithm and multiplying by -2. The term 'likelihood ratio test' is used to describe this test. If the p-value for the overall model fit statistic is less than the conventional 0.05, then reject H_0 with the conclusion.

3.6.2 Chi-Square Goodness of Fit Tests

With logistic regression, instead of R^2 as the statistics for overall fit of the linear regression model, deviance between observed values from the expected values is used. In linear regression, residuals can be defined as $y_i - \hat{y}_i$ where y_i is the observed dependent variable for the i^{th} subject, and $\hat{y}_i$ the corresponding prediction from the model. The same concept applies to logistic regression, where y_i is equal to either 1 or 0, and the corresponding prediction from the model is as

$$\hat{y}_i = \frac{e^{a + \beta_1 \chi_1 + ... + \beta_k \chi_k}}{1 + e^{a + \beta_1 \chi_1 + ... + \beta_k \chi_k}}$$

Chi-square test can be based on the residuals, $y_i - \hat{y}_i$ (Peng & So, 2002). A standardized residual can be defined as

$$r_i = \frac{y_i - \hat{y}_i}{\sqrt{\hat{y}_i(1-\hat{y}_i)}}$$

One can then form a χ^2 statistic as $\chi^2 = \sum_{i=1}^{n} r_i^2$

This statistic follows a χ^2 distribution with n - (k+1) degrees of freedom, so that p-values can be calculated.

3.6.3 Hosmer-Lemeshow Test

The Hosmer-Lemeshow test is to examine whether the observed proportions of events are similar to the predicted probabilities of occurrence in subgroups of the model population. The Hosmer-Lemeshow test is performed by dividing the predicted probabilities into deciles (10 groups based on percentile ranks) and then computing a Pearson Chi-square that compares the predicted to the observed frequencies in a 2-by-10 table. The value of the test statistic is

$$\text{H}= \sum_{g=1}^{10} \frac{(O_g - E_g)^2}{E_g}$$

Where O_g and E_g denote the observed events, and expected events for the g^{th} risk decile group. The test statistic asymptotically follows a χ^2 distribution with 8 (number of groups -2) degrees of freedom. Small values (with large p-value closer to 1) indicate a good fit to the data, therefore, good overall model fit. Large values (with p <0.05) indicate a poor fit to the data (Hosmer & Lemeshow, 2000).

3.6.4 Cox and Snell R-Square

The ratio of the likelihoods reflects the improvement of the full model over the intercept model (the smaller the ratio, the greater the improvement). L(M) is the conditional probability of the dependent variable given the independent variables. If there are N observations in the dataset, then L(M) is the product of N such probabilities. Thus, taking the n^{th} root of the product L(M) provides an estimate of the likelihood of each Y value. Cox & Snell's presents the R-squared as a transformation of the –2ln[L(MIntercept)/L(MFull)] statistic that is used to determine the convergence of a logistic regression. Note that Cox & Snell's pseudo R-squared has a

maximum value that is not 1: if the full model predicts the outcome perfectly and has a likelihood of 1, Cox & Snell's is then $1 - \mathrm{L(M\ Intercept)}^{2/N}$, which is less than one. The Cox and Snell R square is

$$R^2 = 1 - [\frac{L(M_{Intercept})}{L(M_{Full})}]^{2/N}$$

3.7 Statistical Significance of Individual Regression Coefficients

If the overall model works well, the next question is how important each of the independent variables is. The logistic regression coefficient for the i^{th} independent variable shows the change in the predicted log odds of having an outcome for one unit change in the i^{th} independent variable, all other things being equal. That is, if the i^{th} independent variable is changed 1 unit while all of the other predictors are held constant, log odds of outcome is expected to change b_i units.

3.7.1 Wald Statistic

The Wald statistic is the ratio of the square of the regression coefficient to the square of the standard error of the coefficient. The Wald statistic is asymptotically distributed as a Chi-square distribution. Wald test is used as a test of significance for the coefficients in the logistic regression.

$$W_j = \frac{\beta_j^2}{SE_{\beta_j^2}}$$

Each Wald statistic is compared with a Chi-square with 1 degree of freedom. Wald statistics are easy to calculate but their reliability is questionable (Bewick et al.2005).

3.7.2 Odds Ratios with 95% Confidence Interval (CI)

Odds ratio with 95% confidence interval (CI) can be used to assess the contribution of individual predictors (Katz, 1999). It is important to note however, that unlike the p value, the 95% CI does not report a measure's statistical significance. It is used as a proxy for the presence of statistical significance if it does not overlap the null value (e.g. OR=1).

The 95% CI is used to estimate the precision of the OR. A large CI indicates a low level of precision of the OR, whereas a small CI indicates a higher precision of the OR. An approximate confidence interval for the population log odds ratio is

$$95\% \text{ CI for the ln (OR)} = \ln (OR) \pm 1.96 \times \{SE \ln (OR)\}$$

Where ln (OR) is the sample log odds ratio, and SE ln (OR) is the standard error of the log odds ratio. Taking the antilog, we get the 95% confidence interval for the odds ratio:

$$95\% \text{ CI for OR} = \exp \text{In (OR)} \pm 1.96 \times \{SE \text{ In (OR)}\}$$

3.8 Definition of Selected Variables

In this study, the dependent variable was wealth index, poor is 1 and otherwise 0 non-poor and the six independent variables were gender, age, marital status, educational level, occupational level and industry of household heads. The description of variables is described in Table (3.1).

Poverty: It is divided into two groups as poor and non-poor.

Gender of Household Head: It refers to the male or female of household head.

Age of Household Head: It classifies the age group of household heads such as 15-29, 30-44, 45-59, 60 and over.

Marital Status of Household Head: It identifies the marital status of household heads such as single, married, widowed and divorced household head.

Educational Level of Household Head: The education of household head has divided into five groups, no schooling, primary school level, middle school level, high school level and higher education.

Occupation Status of Household Head: The occupation of household head is classified as six categories. They are government employees, private employees, employers, own account workers, family workers and unemployment.

Industrial Sector of Household Head: The industrial sector was divided into three groups; primary, secondary and tertiary sectors. Primary sector consists of firming, mining, fishing and forestry. Consumer goods, manufacturing, construction, craft and fashion, and water supply, sewerage, waste management and remediation activities are included in the secondary sector. Tertiary sector includes tele-communication, professional services and franchises.

Table (3.1) Variables Description for Poverty Situation

Dependent Variable	**Code**
Poverty	0 = non-poor 1 = poor
Independent Variables	**Code**
Gender	1 = male 2 = female
Age	1 = less than 25 years 2 = 25-34 3 = 35-44 4 = 45-54 5 = 60 and over
Marital status	1 = single 2 = married 3 = other (widowed and divorced)
Educational level	1 = no school 2 = primary school 3 = middle school 4 = high school 5 = higher education
Occupation	1 = Employee (Government) 2 = Employee (Private) 3 = Employer 4 = Own account worker 5 = Family worker 6 = Unemployed person
Industrial Sector	1 = Primary sector 2 = Secondary sector 3 = tertiary sector

CHAPTER IV
DETERMINANTS OF POVERTY

In this chapter**,** the construction of the wealth index, descriptive statistics, association of poverty and demographic and socio-economic characteristics and determinants factors of poverty in Hlaing Thayar Township based on the 2014 Myanmar Population and Housing Census data were described.

4.1 Construction of Wealth Index

The wealth index is a composite measure of a household's cumulative living standard. It can be calculated using easy to collect data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction and types of water access and sanitation facilities. And also it considered effective indicators of long-term socio-economic position, living standard or material well-being of households. Important reasons for the success of wealth index are simple computation, intuitive appeal and wide availability in household surveys such as the Demographic and Health Surveys (DHS) and UNICEF Multiple Indicator Cluster Surveys (MICS). Also the fact that the required data can be more reliably measured than those needed for computing income or expenditure measures, the most obvious alternatives, has contributed to their success. Wealth index is constructed on the basis of the assets available in the survey data.

Wealth index is constructed by Principal Component Analysis (PCA). In PCA, a new set of variables is created as linear combinations of the original set. The linear combination that explains the maximum amount of variation is called the first principal component (Abeyasekera, 2006). These indicators were then incorporated in the principal components model. The scores on wealth index are therefore interpreted as relative wealth levels. Only variables with principal component coefficients greater than 0.1 were retained in the final index. These were ranked in ascending order from poorest to richest. The sample was divided into five quintiles. The variables used for

constructing wealth index are water source, sanitation, housing materials and ownership of a list of assets.

The wealth index is one way of determining relative poverty. An easy way to understand relative poverty is by dividing the population into wealth quintiles based on the wealth index. The wealth index is based on asset ownership and household characteristics rather than monetary income. A variety of asset and household characteristics is needed to create a meaningful wealth index by using Principal Component Analysis (PCA). For the wealth index, the first principal component of the PCA is assumed to represent relative wealth. And it is also assumed that wealth is the factor that accounts for the largest amount of variance between household assets and characteristics.

This study used a series of assets of housing characteristics, basic services and asset ownership. The housing characteristics are classified as type of residence, roof and floor. The basic services include lighting and access to drinking water. Asset ownership consists of the types of ownership; for the radio, television, mobile phone, computer, internet at home, motorcycle and bicycle. The set of variables used in PCA analysis for determining the wealth quintiles of Hlaing Thayar Township was presented in Table (4.1) and concomitant factor weight, mean and standard deviation are described in Table (4.2).

Table (4.1) Selected Variables for Constructing Wealth Index

Housing Material Indicators		**Code**
Type of residence	Rebrick	0 = Other
		1 = Brick or wooden house
	reoth	0 = Brick or wooden house
		1 = Other
Roof	rocor	0 = Other
		1 = Corrugated sheet or concrete
	rooth	0 = Corrugated sheet or concrete
		1 = Other
Floor	fwood	0 = Other
		1 = Wood or concrete
	foth	0 = Wood or concrete
		1 = Other
Electricity, Water Source and Sanitation		**Code**
Lighting	lele	0 = Non electricity
		1 = Electricity
	lnlele	0 = Electricity
		1 = Non electricity
Drinking water	wpipe	0 = Piped water
		1 = Surface water/ Other
	wsuf	0 = Surface water
		1 = Piped water/ Other
	woth	0 = Other
		1 = Piped/Surfaced water
Ownership of Household Assets		**Code**
Type of Ownership	owner	0 = Not owner
		1 = Owner
	nowner	0 = Owner
		1 = Not owner
Radio		0 = No
		1 = Yes
Television		0 = No
		1 = Yes
Mobile phone		0 = No
		1 = Yes
Computer		0 = No
		1 = Yes
Internet at Home		0 = No
		1 = Yes
Motorcycle		0 = No
		1 = Yes
Bicycle		0 = No
		1 = Yes

Table (4.2) Factor Weight, Mean and Standard Deviation

Variables	Component 1	Mean	Std. Dev
rebrick	0.134	0.7435	0.4367
reoth	-0.134	0.2565	0.4367
owner	0.015	0.4347	0.49572
nowner	0.015	0.5653	0.49572
lele	0.125	0.7622	0.42575
lnlele	-0.125	0.2378	0.42575
wpipe	-0.042	0.2468	0.43116
wsuf	0.064	0.6683	0.47084
woth	-0.042	0.0849	0.27874
rocor	0.129	0.8378	0.36864
rooth	-0.129	0.1622	0.36864
fwood	0.132	0.8122	0.39057
foth	-0.132	0.1878	0.39057
radio	-0.002	0.1073	0.30952
television	0.066	0.6752	0.46829
mobile phone	0.065	0.504	0.49999
internet at home	0.033	0.091	0.28763
motorcycle	0.023	0.1131	0.31678
bicycle	0.022	0.5356	0.49873

Source: The 2014 Myanmar Population and Housing Census

Each variable is given a factor weight based on the first principal component. The factor weight represents the relative importance of each variable to the constitution of the first principal component. Through PCA, each asset and household characteristic is given a weight factor and each respondent can be given a wealth index score from minimum to maximum.

The range of wealth index scores and percentage corresponding to each wealth quintile for Hlaing Thayar Township are described in Table (4.3).

Table (4.3) Wealth Index Score of Hlaing Thayar Township

Quintile	Minimum Wealth Index Score	Maximum Wealth Index Score	Percent (%)
Poorest	-2.48930	-0.80706	20.5
Poorer	-0.80558	-0.35098	19.8
Middle	0.35330	0.57397	20.3
Richer	0.57789	0.70006	19.4
Richest	0.70020	0.94455	20.0

Source: The 2014 Myanmar Population and Housing Census

According to Table (4.2), the first two groups, such as the poorest and poorer household heads are involved in the poor. The non-poor include the last three groups, such as middle, richer and richest. Therefore, it has been found that 40% of household heads are poor and 60% of those are non-poor in this township.

4.2 Descriptive Statistics

In Hlaing Thayar Township, there are 11339 household heads according to the 2014 Myanmar Population and Housing Census. Table (4.4) displays household heads by poverty level. Table (4.5) also presents the Distribution of Sex, Age, Marital Status, Education, Occupation and Industrial Sector of Household Head.

Table (4.4) Distribution of Poverty, Hlaing Thayar Township

Poverty Level	Frequency	Percent (%)
Poor	4565	40.3
Non-poor	6774	59.7

Source: The 2014 Myanmar Population and Housing Census

According to the Table (4.4), there are 4565 household heads who are poor people, but 6774 household heads are not poor in this township.

Table (4.5) showed the distribution of Sex, Age, Marital Status, Education, Occupation and working in Industrial Sector of Household Head, Hlaing Thayar Township.

Table (4.5) Distribution of Sex, Age, Marital Status, Education, Occupation and Industrial Sector of Household Heads

Gender	**Number**	**Percent (%)**
Male	9927	87.5
Female	1412	12.5
Age Group	**Number**	**Percent (%)**
15-24	1097	9.7
25-34	3548	31.3
35-44	3295	29.1
45-54	2294	20.2
Above 55	1105	9.7
Marital Status	**Number**	**Percent (%)**
Single	1132	10.0
Married	9546	84.2
Other	661	5.8
Educational Level	**Number**	**Percent (%)**
No Schooling	386	3.4
Primary	3695	32.6
Middle	3958	34.9
High	2213	19.5
Higher	1087	9.6
Occupational Status	**Number**	**Percent (%)**
Employee (government)	291	2.6
Employee (private)	7587	66.9
Employer	460	4.1
Own Account Worker	2868	25.3
Family Worker	71	0.6
Unemployed Person	62	0.5
Industrial Sector	**Number**	**Percent (%)**
Primary Sector	343	3.0
Secondary Sector	5706	50.3
Tertiary Sector	5290	46.7

According to the Table (4.5), there are 9927 (87.5%) male household heads and 1412 (12.5%) female heads. The percentage of household heads with ages between 25-44 is 60%. 84.2% household heads are married and followed by 10 % who are single and 8.5 % are other. Furthermore, there are 3.4 % of household heads who have never been to school in their lifetime. The percentage of household heads who have completely attended primary school, middle school, high school and higher education are 32.6 %, 34.9 %, 19.5 % and 9.6 % respectively. Table (4.5) also presents that 2.6% of household heads are government employee, 66.9% are private companies' employees, 4.1% are employer, 25.3% are own account worker, 0.6% are family worker and 0.5% are unemployed Person. Three percent of the household heads work in the primary industrial sector was 3.0% that of secondary sector (50.3%) and the tertiary sector (46.7%).

4.3 Association of Poverty and Some Demographic and Socio-economic Characteristics

The values of the Pearson's Chi Square test conducted for the association between poverty and demographic characteristics of the household heads such as sex, age and marital status, as well as that for the association between poverty and socio-economic characteristics of the household heads such as education level, occupational status and industrial sector are described in Table (4.6).

Table (4.6) Association of Poverty and Some Demographic and Socio-economic Characteristics of Household Head

Variable	Poverty (%)		Chi-Square	P-Value
	Poor	Non-Poor		
Gender of Household Head				
Male	4037(88.4)	5890(87.0)		
Female	528(11.6)	884(13.0)	5.506	0.019**
Age of Household Head (in years)				
15-24	466(10.2)	631(9.3)		
25-34	1410(30.9)	2138(31.6)		
35-44	1348(29.5)	1947(28.7)		
45-54	827(20.3)	1367(20.2)	6.832	0.145
55-64	414(9.1)	691(10.2)		
Marital Status of Household Head				
Single	344(7.5)	788(11.6)		
Married	3893(85.3)	5653(83.5)		
Other	328(7.2)	333(4.9)	71.029	0.000***
Education of Household Head				
No Schooling	226(5.0)	160(2.4)		
Primary	1985(43.5)	1710(25.2)		
Middle	1535(33.6)	2423(35.8)		
High	609(13.3)	1604(23.7)	683.214	0.000***
Higher	210(4.6)	877(12.9)		
Occupational Status of Household Head				
Employee (gov.)	66(1.4)	225(3.3)		
Employee (priv.)	3273(71.7)	4314(63.7)		
Employer	90(2.0)	370(5.5)		
Own Account Worker	1069(23.4)	1799(26.6)	164.610	0.000***
Family Worker	31(0.7)	40(0.6)		
Unemployed Person	36(0.8)	26(0.4)		
Industrial Sector				
Primary Sector	149(3.3)	194(2.9)		
Secondary Sector	2480(54.3)	3226(47.6)	55.288	0.000***
Tertiary Sector	1936(42.4)	3354(49.5)		

Source: SPSS Output

***denotes significant at 1% level, **denotes significant at 5% level and * denotes significant at 10% level

According to Table (4.6), the result indicates that there is statistically significant association between poverty and five predictor variables, such as gender at 5% level and marital status, education, occupation, and industrial sector employed of household heads at 1% level respectively. There is no statistically significant association between poverty and the age of household head. The percentage of male-headed poor households is 88.4 % and that of female-headed poor households is 11.6%. Among the age-groups, the proportion of poor household heads aged 25-34 years is 30.9% which represents the highest percentage compared to other age groups. The married poor household heads represent 85.3%. It can be found that 43.5% of poor household heads completed the primary educational level. In addition, 71.7% of poor household heads are employees in the private sector and 54.3% and 42.4% are working in the secondary and tertiary sector respectively.

4.4 Results of Binary Logistics Regression Model

Based on the 2014 Myanmar Population and Housing Census Data of Hlaing Thayar Township, six factors are studied by using binary logistic regression. In this study, poverty is considered as dependent variable and it takes the value of 1 when the household head is poor and otherwise. Sex, age, marital status, education and occupation of household head are also considered as the independent variables. The binary logistic regression model can be written as

The binary logistic regression model can be written as;

$$\log[\,y] = \log \frac{\pi_i}{1-\pi_i} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

where, Y_i = Poverty level

= 0, if household head is non poor

= 1, if household head is poor

β_0 = Constant

β_i = Coefficients of the independent variables

X_1 = Gender of household head

X_2 = Age of household head

X_3 = Marital Status of household head

X_4 = Occupation of household head

X_5 = Education of household head

X_6 = Working in Industrial sector of household head

The overall model fitting information for binary logistic regression model is given in Table (4.7).

Table (4.7) Overall Model Fitting Information

Model Fitting Criteria	Chi-Square Value	df	P-value
Omnibus Test of Model Coefficient	911.217	18	0.0000
Hosmer and Lemeshow (H-L) Test	0.991	8	.998
-2Log Likelihood	14374.786		
Cox & Snell R Square	0.077		
Nagelkerke R Square	0.104		
Overall Correct Prediction	63.6		

Source: SPSS Output

In Omnibus test of model coefficient, the inclusion of five explanatory variables yield a chi-square value of 911.217 with 18 degree of freedom, p=0.000. Therefore, the overall model is statistically significant, which means that adding the five explanatory variables to the model have significantly increased ability to predict whether the factors influenced on poverty situation.

The measure of model fit the Hosmer and Lemeshow test, which measures the correspondence of the actual and predicted values of the dependent variable. The better model fit is included by a smaller difference in the observed and predicted classification. Hosmer-Lemeshow test statistic gives χ^2value 0.991with p-value 0.998 and revealed that the test is no significant. Therefore, it can conclude that the fitted model is good.

The -2 log likelihood statistics is 14374.786. Table (4.7) provides some approximation of R^2 statistics in logistic regression. Cox and Snell's R^2 attempts to imitate multiple R^2 based on likelihood. The result of Cox and Snell's R^2 and the Negelkerke R^2 are 0.077 and 0.104 which indicate a reasonable fit of the model to the data. This shows that 7.7 % of the variation and 10.4 % of variation in poverty are explained by the model. The overall model evaluation is correctly predicted about 63.6 %.

Table (4.8) Results of Binary Logistic Regression Model

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Gender of Household Head								
Male	0.256***	0.087	8.556	1	0.003	1.291	1.088	1.533
Female (ref.)								
Age of Household Head								
25 - 34	-0.152**	0.074	4.237	1	0.04	0.852	0.743	0.993
35 - 44	-0.195**	0.076	6.512	1	0.011	0.823	0.709	0.956
45 - 54	-0.244***	0.081	9.084	1	0.003	0.784	0.669	0.918
more than 54	-0.366***	0.095	14.957	1	0.000	0.694	0.576	0.835
less than 25 (ref.)								
Marital Status of Household Head								
Single	-0.781***	0.112	48.623	1	0.000	0.458	0.368	0.57
Married	-0.504***	0.106	22.462	1	0.000	0.604	0.49	0.744
Other (ref.)								
Educational Level of Household Head								
Primary School Level	-0.191*	0.11	3.023	1	0.082	0.826	0.666	1.025
Middle School Level	-0.784***	0.11	50.781	1	0.000	0.457	0.368	0.566
High School Level	-1.285***	0.116	123.15	1	0.000	0.277	0.221	0.347
Higher Education Level	-1.636***	0.131	155.46	1	0.000	0.195	0.151	0.252
No Schooling (ref.)								
Occupational Status of Household Head								
Employee (gov.)	-1.045***	0.303	11.895	1	0.001	0.352	0.194	0.637
Employee (priv.)	-0.5*	0.267	3.511	1	0.061	0.606	0.359	1.023
Employer	-1.497***	0.292	26.302	1	0.000	0.224	0.126	0.396
Own Account Worker	-0.724***	0.269	7.26	1	0.007	0.485	0.286	0.821
Family Worker	-0.422	0.366	1.331	1	0.249	0.656	0.32	1.343
Unemployed Person(ref.)								
Industrial Sector of Household Head								
Secondary Sector	0.009	0.117	0.006	1	0.939	1.009	0.802	1.269
Tertiary Sector	-0.199*	0.117	2.89	1	0.089	0.089	0.651	1.031
Primary Sector (ref.)								
Constant	1.47	0.325	20.481	1	0.000	4.351		

Source: SPSS Output

***denotes significant at 1% level, **denotes significant at 5% level and * denotes significant at 10% level

Table (4.8) presents the results indicating that gender of household head has positive and statistically significant effect on poverty at 1% level. Male-headed households are about 1.29 times more likely to be poor as compared to females. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 1.09 fold increase to a 1.53 fold increase.

The age of household head is statistically significant and negative effect on poverty. It can be seen that household heads of the age group 25-34 are about 0.148 times less likely to be poor as compared to household heads with an age group under 25. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 0.7% decrease to a 25.7% decrease. The odd ratios of household heads with age group 35-44, 45-54 and more than 54 are 0.823, 0.784 and 0.694. It indicates that household heads in the age group 35-44 are 17.7% less likely to be poor as compared to household heads in the age group under 25. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 4.4% decrease to a 29.1% decrease. Household heads aged 45-54 are about 21.6% less likely to be poor as compared to household heads with an age group under 25. The 95% confidence interval suggests that the magnitude of effect could be anywhere from an 8.2 % decrease to a 33.1% decrease. Household heads aged over 54 are about 30.6% less likely to be poor as compared to household heads with an age group under 25. The 95% confidence interval suggests that the magnitude of an effect could be anywhere from a 16.5% decrease to a 42.4 % decrease.

Marital status was statistically significant at 1 % level and negatively had effects on poverty. Headings of a single household head are 54.2% less likely to be poor compared to those widowed or divorced. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 43% decrease to a 63.2% decrease. Married household heads are 39.6% less likely to be poor compared to those widowed or divorced. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 25.6% decrease to a 51% decrease.

Education of household head is significantly explains and negative influence effect on poverty in Hlaing Thayar township. With odd ratio of 0.826, household heads who have completed primary education level are 17.4% less likely to be poor compared to those with no schooling. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a -2.5% decrease to a 33.4% decrease. Household heads who have completed secondary education level are 54.3% less likely

to be poor compared to those with no schooling. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 43.4% decrease to a 63.2% decrease. Household heads who have completed a high education level are 72.3% less likely to be poor compare to those with no schooling. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 65.3% decrease to a 77.9% decrease. Household heads who have completed higher education level are 80.5% less likely to be poor than those who have no schooling. The 95% confidence interval suggests that the magnitude of effect could be anywhere from an 74.8% decrease to a 84.9% decrease.

Occupational status of household head is statistically significant except family worker. Household heads who are government staff are 64.8% less likely to be poor compared to those not working. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 36.3% decrease to an 80.6% decrease. Household heads who are private employees are 39.4% less likely to be poor compared to those not working. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a -2.3% decrease to a 64.1% decrease. Household heads who are employers are 77.6% less likely to be poor compared to those not working. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 60.4% decrease to an 87.4% decrease. Household heads who are own account workers are 51.5% less likely to be poor compared to those not working. The 95% confidence interval suggests that the magnitude of effect could be anywhere from a 17.9% decrease to a 71.4% decrease. Household heads who is family workers does not significantly explain the poverty in this model.

The coefficient of the tertiary sector was statistically significant at 10% level and negatively had effects on poverty. Household heads who are working in the tertiary industrial sector are 91.1% less likely to be poor as compared to those in the primary sector. The 95% confidence interval suggests that the magnitude of an effect could be anywhere from a -3.1% decrease to 34.9% decrease.

CHAPTER V
CONCLUSION

In this chapter**,** findings and discussion, recommendation and further studies were described.

5.1 Findings and Discussion

The main objective of this study is to explore the factors affecting the poverty in Hlaing Thayar Township. The number of male-headed households is higher than that of female-headed households in this township. It was found that the number of household heads with the age group of age 25-34 was the highest compared to other age groups. The number of married household heads is more than household heads who are single, widowed and divorced. Uneducated household heads are less than educated household heads. Most of the poor household heads are employed in the private sector and secondary industrial sector.

In this township, it can be seen that the number of non-poor household heads was higher than that of poor household heads. According to the results of the association test, poverty was related to the gender, marital status, educational level, occupational status and industrial sector employed of the household heads.

The results of binary logistic regression model show that gender, age, educational level, occupational status except family worker working in tertiary sector are statistically significant. These results are consistent with most of the previous studies. However, although this study found that male-headed households were more likely to be poor than female-headed households, Osowole et al. (2012), Habyarimana et al. (2015), Peng et al. (2019) and Sugiharti et al. (2022) pointed out that a household headed by a female was more likely to be poor than a household headed by a male.

The households' heads with the age group of 25-54 years and over 54 years respectively have less risk of being poverty than the under 25 age group. This is in

line with other findings from Rodriguez (2000), Osowole et al. (2012), Habyarimana et al. (2015) and Sugiharti et al. (2022).

The married household heads have less risk of being poverty than household heads with other marital status such as divorced or widowed. This result was consistent with previous study of Ambros and Saxena, (2018) which found out that the marital status has a significant effect on the determination of acute poverty and also the status of the household head being divorced or separated are more likely to be in acute poverty.

This study also found that, the higher the level of education attained by the heads of household, the lesser the probability of the households being to be poverty in this township. The household heads reaching a higher education level were found to have the least chance of being poverty. The findings of this study agreed with the previous studies of Habyarimana et al. (2015), Ambros and Saxena, (2018), Peng et al. (2019), and Sugiharti et al. (2022).

The household heads, who were government employees, private employees, employers and own account workers had less chance to be poor as compared to unemployed household heads. This findings are previous findings from Rodriguez, (2000), Osowole et al., (2012), Ambros and Saxena, (2018), Peng et al. (2019) and Sugiharti et al. (2022) respectively. In addition, it was also found that the household heads who work in tertiary sector had less chance to be poor as compared to those work in primary sector in Hlaing Thayar Township.

5.2 Recommendation

In order to improve the quality of human capital, it is suggested that educational programs such as a formal education program, a vocational education program, an empowering and strengthening entrepreneurial skills program for workers should be developed by the government's policy makers. Furthermore, the government needs more job opportunities for the people living in Hlaing Thayar Township because they can get a regular income, which may avoid acute poverty situations. Additionally, it is also recommended that there should be financial assistance such as small business loans for those people who want to build their own business in order to reduce the poverty level in this area.

5.3 Further Studies

This study used the binary logistic regression model for determining the demographic and socio-economic effects of poverty based on a sample of households from 2014 Hlaing Thayar Township's Population and Housing Census. The COVID-19 (Coronavirus) pandemic triggered a global public health crisis in 2020 and the country enacted unprecedented emergency measures, such as travel bans, mobility restrictions, closure of non-essential businesses, limitations on public gatherings, and mandatory home-based work that severely affected economic activity, household incomes, business revenue, employment, small-scale businesses, low-income households, and vulnerable populations. Therefore, additional research should be conducted to further explore the determinants of poverty situation. And also, the further research on poverty should be conducted in order to produce the poverty line if income and expenditure data are available. Moreover, further study should be carried out using the appropriate and relevant variables such as place of residence, per capita income, household expenditure, dependency ratio and number of working people in a household so that the more accurate findings of poverty situation will be found out.

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Appendix

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	9927	87.5	87.5	87.5
	Female	1412	12.5	12.5	100.0
	Total	11339	100.0	100.0	

Marital_Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	1132	10.0	10.0	10.0
	Married	9546	84.2	84.2	94.2
	Other	661	5.8	5.8	100.0
	Total	11339	100.0	100.0	

Educational_Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Schooling	386	3.4	3.4	3.4
	Primary Level	3695	32.6	32.6	36.0
	Middle Level	3958	34.9	34.9	70.9
	High Level	2213	19.5	19.5	90.4
	Higher Education	1087	9.6	9.6	100.0
	Total	11339	100.0	100.0	

Ocupational_Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee(gov)	291	2.6	2.6	2.6
	Employee(priv)	7587	66.9	66.9	69.5
	Employer	460	4.1	4.1	73.5
	Own Account Worker	2868	25.3	25.3	98.8
	Contributing Family Worker	71	.6	.6	99.5
	Unemployed Person	62	.5	.5	100.0
	Total	11339	100.0	100.0	

OCP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	employed	11206	98.8	98.8	98.8
	unemployed	133	1.2	1.2	100.0
	Total	11339	100.0	100.0	

WI

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Non poor	6774	59.7	59.7	59.7
	Poor	4565	40.3	40.3	100.0
	Total	11339	100.0	100.0	

Industrial_Sector

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Primary Sector	343	3.0	3.0	3.0
	Secondary Sector	5706	50.3	50.3	53.3
	Tertiary Sector	5290	46.7	46.7	100.0
	Total	11339	100.0	100.0	

WI * Gender

Crosstab

			Gender		Total
			Male	Female	
WI	Non poor	Count	5890	884	6774
		Expected Count	5930.5	843.5	6774.0
		% within WI	87.0%	13.0%	100.0%
		% within Gender	59.3%	62.6%	59.7%
		% of Total	51.9%	7.8%	59.7%
	Poor	Count	4037	528	4565
		Expected Count	3996.5	568.5	4565.0
		% within WI	88.4%	11.6%	100.0%
		% within Gender	40.7%	37.4%	40.3%
		% of Total	35.6%	4.7%	40.3%
Total		Count	9927	1412	11339
		Expected Count	9927.0	1412.0	11339.0
		% within WI	87.5%	12.5%	100.0%
		% within Gender	100.0%	100.0%	100.0%
		% of Total	87.5%	12.5%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.506[a]	1	.019		
Continuity Correction[b]	5.371	1	.020		
Likelihood Ratio	5.546	1	.019		
Fisher's Exact Test				.019	.010
Linear-by-Linear Association	5.506	1	.019		
N of Valid Cases	11339				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 568.46.

b. Computed only for a 2x2 table

WI * Marital_Status

Crosstab

			Marital_Status			Total
			Single	Married	Other	
WI	Non poor	Count	788	5653	333	6774
		Expected Count	676.3	5702.8	394.9	6774.0
		% within WI	11.6%	83.5%	4.9%	100.0%
		% within Marital_Status	69.6%	59.2%	50.4%	59.7%
		% of Total	6.9%	49.9%	2.9%	59.7%
	Poor	Count	344	3893	328	4565
		Expected Count	455.7	3843.2	266.1	4565.0
		% within WI	7.5%	85.3%	7.2%	100.0%
		% within Marital_Status	30.4%	40.8%	49.6%	40.3%
		% of Total	3.0%	34.3%	2.9%	40.3%
Total		Count	1132	9546	661	11339
		Expected Count	1132.0	9546.0	661.0	11339.0
		% within WI	10.0%	84.2%	5.8%	100.0%
		% within Marital_Status	100.0%	100.0%	100.0%	100.0%
		% of Total	10.0%	84.2%	5.8%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	71.029[a]	2	.000
Likelihood Ratio	72.198	2	.000
Linear-by-Linear Association	70.667	1	.000
N of Valid Cases	11339		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 266.11.

WI * Educational_Level

Crosstab

			Educational_Level					Total
			No Schooling	Primary Level	Middle Level	High Level	Higher Education	
WI	Non poor	Count	160	1710	2423	1604	877	6774
		Expected Count	230.6	2207.4	2364.5	1322.1	649.4	6774.0
		% within WI	2.4%	25.2%	35.8%	23.7%	12.9%	100.0%
		% within Educational_Level	41.5%	46.3%	61.2%	72.5%	80.7%	59.7%
		% of Total	1.4%	15.1%	21.4%	14.1%	7.7%	59.7%
	Poor	Count	226	1985	1535	609	210	4565
		Expected Count	155.4	1487.6	1593.5	890.9	437.6	4565.0
		% within WI	5.0%	43.5%	33.6%	13.3%	4.6%	100.0%
		% within Educational_Level	58.5%	53.7%	38.8%	27.5%	19.3%	40.3%
		% of Total	2.0%	17.5%	13.5%	5.4%	1.9%	40.3%
Total		Count	386	3695	3958	2213	1087	11339
		Expected Count	386.0	3695.0	3958.0	2213.0	1087.0	11339.0
		% within WI	3.4%	32.6%	34.9%	19.5%	9.6%	100.0%
		% within Educational_Level	100.0%	100.0%	100.0%	100.0 %	100.0%	100.0%
		% of Total	3.4%	32.6%	34.9%	19.5%	9.6%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	683.214[a]	4	.000
Likelihood Ratio	703.324	4	.000
Linear-by-Linear Association	666.914	1	.000
N of Valid Cases	11339		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 155.40.

WI * Ocupational_Status

Crosstab

			Ocupational_Status						Total
			Employee (gov)	Employee (priv)	Employer	Own Account Worker	Contributing Family Worker	Unemployed Person	
WI	Non poor	Count	225	4314	370	1799	40	26	6774
		Expected Count	173.8	4532.5	274.8	1713.4	42.4	37.0	6774.0
		% within WI	3.3%	63.7%	5.5%	26.6%	0.6%	0.4%	100.0%
		% within Ocupational_Status	77.3%	56.9%	80.4%	62.7%	56.3%	41.9%	59.7%
		% of Total	2.0%	38.0%	3.3%	15.9%	0.4%	0.2%	59.7%
	Poor	Count	66	3273	90	1069	31	36	4565
		Expected Count	117.2	3054.5	185.2	1154.6	28.6	25.0	4565.0
		% within WI	1.4%	71.7%	2.0%	23.4%	0.7%	0.8%	100.0%
		% within Ocupational_Status	22.7%	43.1%	19.6%	37.3%	43.7%	58.1%	40.3%
		% of Total	0.6%	28.9%	0.8%	9.4%	0.3%	0.3%	40.3%
Total		Count	291	7587	460	2868	71	62	11339
		Expected Count	291.0	7587.0	460.0	2868.0	71.0	62.0	11339.0
		% within WI	2.6%	66.9%	4.1%	25.3%	0.6%	0.5%	100.0%
		% within Ocupational_Status	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	2.6%	66.9%	4.1%	25.3%	0.6%	0.5%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	164.610[a]	5	.000
Likelihood Ratio	175.551	5	.000
Linear-by-Linear Association	10.865	1	.001
N of Valid Cases	11339		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 24.96.

WI * Age1

Crosstab

			Age1					Total
			below 24	25-34	35-44	45-54	above 55	
WI	Non poor	Count	631	2138	1947	1367	691	6774
		Expected Count	655.4	2119.6	1968.5	1370.5	660.1	6774.0
		% within WI	9.3%	31.6%	28.7%	20.2%	10.2%	100.0%
		% within Age1	57.5%	60.3%	59.1%	59.6%	62.5%	59.7%
		% of Total	5.6%	18.9%	17.2%	12.1%	6.1%	59.7%
	Poor	Count	466	1410	1348	927	414	4565
		Expected Count	441.6	1428.4	1326.5	923.5	444.9	4565.0
		% within WI	10.2%	30.9%	29.5%	20.3%	9.1%	100.0%
		% within Age1	42.5%	39.7%	40.9%	40.4%	37.5%	40.3%
		% of Total	4.1%	12.4%	11.9%	8.2%	3.7%	40.3%
Total		Count	1097	3548	3295	2294	1105	11339
		Expected Count	1097.0	3548.0	3295.0	2294.0	1105.0	11339.0
		% within WI	9.7%	31.3%	29.1%	20.2%	9.7%	100.0%
		% within Age1	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	9.7%	31.3%	29.1%	20.2%	9.7%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.832[a]	4	.145
Likelihood Ratio	6.848	4	.144
Linear-by-Linear Association	2.248	1	.134
N of Valid Cases	11339		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 441.64.

WI * Industrial_Sector

Crosstab

			Industrial_Sector			Total
			Primary Sector	Secondary Sector	Tertiary Sector	
WI	Non poor	Count	194	3226	3354	6774
		Expected Count	204.9	3408.8	3160.3	6774.0
		% within WI	2.9%	47.6%	49.5%	100.0%
		% within Industrial_Sector	56.6%	56.5%	63.4%	59.7%
		% of Total	1.7%	28.5%	29.6%	59.7%
	Poor	Count	149	2480	1936	4565
		Expected Count	138.1	2297.2	2129.7	4565.0
		% within WI	3.3%	54.3%	42.4%	100.0%
		% within Industrial_Sector	43.4%	43.5%	36.6%	40.3%
		% of Total	1.3%	21.9%	17.1%	40.3%
Total		Count	343	5706	5290	11339
		Expected Count	343.0	5706.0	5290.0	11339.0
		% within WI	3.0%	50.3%	46.7%	100.0%
		% within Industrial_Sector	100.0%	100.0%	100.0%	100.0%
		% of Total	3.0%	50.3%	46.7%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	55.288[a]	2	.000
Likelihood Ratio	55.410	2	.000
Linear-by-Linear Association	50.099	1	.000
N of Valid Cases	11339		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 138.09.