

# Quantitative Analysis of Poverty Indicators: The Case of Khon Kaen Province, Thailand

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## Abstract

This study examines the poverty indicators in Northeast region of Thailand by adopting the global Multidimensional Poverty Index (MPI) methodology and the national survey of Minimum Basic Needs (MBN) of Thailand. Data are collected from three different districts in Khon Kaen province namely: Khok Po Chai, Sam Sung, and Nam Pong. The sample size is 187 households. Data analysis uses Ordinary Least Square (OLS) regression approach and includes 7 dimensions of poverty (health, environment, education, economy, Thai value, asset? empowerment, and digital literacy) with a total of 41 indicators. This study has found that poverty indicators in Khon Kaen province remains centered around the aspects of health and employment dimensions. While a change of family structure in the Thai society since 1960s reduces the family size, household saving substantially increases over the years. The effects of health dimension in poverty, on the other hand, appears on the other poverty dimension of Thai value, which include (1) a bad living habit of head of household (smoke or alcohol consumption) that links with illness and disease, (2) religious practice, and (3) chronic illness. Lastly, there are income gaps of different careers in the area, which suggests the issue of income inequality.

**Keywords:** Poverty Indicator, Development Economics, Health, Education, Thailand.

**JEL Classification Code:** DO11, O23, O40, E62

## 1. Introduction

Poverty is a multi-faceted phenomenon which affects not only the individual's purchasing power, but also vulnerability towards various pressures that may prohibit one from living a good life (United Nations Development Programme: UNDP, 2002). Poverty is both a cause of and a result from living conditions such as employment, health, education, and shelter. Therefore, it is important for the government to monitor and understand the causes and

conditions of poverty in order to formulate effective national strategies for poverty reduction.

In Thailand, poverty eradication program has been one of the remarkable development success stories in the developing world. From 1980 to 2015 the country was able to reduce the poverty level from 62 percent to 7.2 percent as measured by the upper-middle income class poverty line of 5.5 USD per day (World Bank, 2019). As poverty plummeted, the well-being has considerably improved and notably with respect to health and education (Organization for Economic Cooperation and Development, 2018). However, in recent years, Thailand has experienced an increase in poverty and inequality mainly due to the impact of the economic slowdown and falling in agricultural price. According to the United Nations Development Programme, as of 2016, there were approximately 8.6 percent of Thailand's population living below the poverty line. The poverty rate decreased to 7.2 percent in 2017 but again increased to 8.6 percent in 2018 (United Nations Development Programme: UNDP, 2019).

On average, the poverty rate in Thailand from 2016 to 2018 was at around 8.13 percent.

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The stagnating in poverty condition over the past three years has become challenging for the Thai government in making progress in its development programs across country. While poverty principally stem from many factors, unequal education quality, health disparity, and income inequality remain the biggest challenges in Thailand. Poorer areas are being underserved with very little amount resource are being allocated to rural schools. Lack of adequate infrastructure and education materials are mostly located in poorer regions of the country. The World Bank (2019) reported that there is a 3.8 years-learning gap between children from poorer areas and children from the urban area in Thailand. The expected years of school of a child born today is 12.4 years before the age of 18, but rural children can expect to complete only 8.6 learning-adjusted years of schooling. Children's health has also been one of the most concern health disparity in Thailand. The Asian Development Bank (ADB) reported that, as of 2017, for every 1,000 babies born in Thailand, 10 die before their fifth birthday. The maternal mortality rate, on the other hand, as reported in 2015 is 20 deaths per 100,000 live births, while the total infant mortality rate is 9.4 deaths per 1,000 live births, indicating a close link between the poverty mortality rates (Asian Development Bank, 2019).

This research surveyed the Basic Minimum Needs (BMN) of population in three districts of Khon Kaen province, namely Khok Po Chai district, Sam Sung district, and Nam Pong district, which are identified by a preliminary analysis of the BMN (Amornbunchornvej, 2019). The survey questions were developed based on the Thailand's Basic Minimum Needs questionnaire (B.E. 2560), which covers five groups of dimensions, namely health, environment, education, economy, and Thai value. In this survey, we incorporated three additional dimensions including assets, empowerment and digital literacy.

## 2. Literature Review

### 2.1. Health

In general, the international standard of good health quality can be measured by the nutrition and child mortality. The United Nations Children's Fund (UNICEF, 2013) measures the nutrition level in a household through the nutrition of newborn baby, children aged 1 to 12, and adult aged 70 or older. A newborn baby is determined having malnutrition if he or she weighs less than 2,500 grams or not getting sufficient breast feeding within the first 6 months (Wagner, Wagner, & Mathis, 1967). In addition, a malnutrition of a pregnant woman could lead to a malnutrition of a new born. Children aged 1 to 12 years of age are expected to receive sufficient number of vaccines

such as of at least the immunization against diphtheria, tetanus and pertussis (DTP) between age 1 to 5 years old. Having lack of adequate immunization at a certain age period has led to an increase in child mortality in countries across the world (UNDP, 2019).

For adult outside of age range 1 to 12 or 70 year of age or older, a good health quality can be measured through access to healthcare, proper food preparation, healthy behavior such as exercising and refraining from smoking or consuming alcohol. This group of people are considered the main source of household income, when they become ill or injured, the entire household can become trapped in a downward spiral of lost income and high healthcare costs (Walraven, 2003, p.3).

With a similar standard to the United Nation, the national survey of Minimum Basic Needs (MBN) of Thailand identifies seven indicators of health dimension as follows: (1) new born babies in the household weigh at least 2,500 grams or more; (2) new born babies in the household are breast fed at least 6 months or more; (3) new born babies and children aged 1 to 12 in the household have received sufficient vaccines; (4) the household or the family follows minimum standard of hygienic cooking or food preparing, i.e. not eating raw meat, checking expiration date on the food package, etc.; (5) the household or the family has access to or use proper over the counter medicines or first aid procedure; (6) household members aged 35 or older have regularly received annual health-check; and (7) household members aged 6 or older regularly exercise 3 days per week and at least 30 minutes per day.

### 2.2. Environment (Standard of Living)

Environment quality plays significant role in people's health, productivity, and capacity to live a good life. Health outcomes are results of environmental conditions (Shyamsundar, 2002). In the context of this research, environment refers to a condition of the physical place in which the household lives, and the household has access to sufficient amount of drinkable water, a clean water source for general household consumption, necessary utilities, etc. Over the past three decades, international organization, such as United Nations Development System, World Health Organization, and the World Bank have developed a set of poverty-environment indicators under the general categories that include access to clean water, access to sanitation, use of traditional fuels, use of insecticide treated nets, child mortality, prevalence of diarrhea and acute respiratory infection (United Nations Poverty-Environment Initiative: UNPEI, 2011). Evidences from countries across the world suggest that the two most important ways in which environmental quality has a negative impact on the health of the poor is through water and indoor air pollution.

Respiratory infections and diarrheal diseases are the two biggest causes of death among the poorest 20 percent of the world's countries (Gwatkin & Guillot, 1999).

Environment is also seen as an important factor determining the quality of life in Thailand. The national survey of Minimum Basic Needs (MBN) of Thailand identifies seven indicators of environment dimension as follows: (1) the household lives in a stable house (shelter) and that house (shelter) meets a minimum safety standard; (2) the household has access to clean and drinkable water throughout the year and at least 5 liters per person per day; (3) the household has access to water for general use throughout the year and at least 45 liters per day; (4) the household lives in a clean house and have access to proper utilities and sewage system; (5) the household is not being threaten by any kind of pollution (noise, air, etc.); (6) the household have access to emergency preparedness, instruction, and tool kits; and (7) the household is safe and secured from life and property threatening;

### 2.3. Education

A relationship between education and poverty has received a great attention among scholars and policymakers over the past five decades. Evidence from numbers of studies conducted by international development programs have shown causal links between the two. On one hand, poverty tends to limit children's developmental and educational opportunities. The higher the poverty rate, the greater the number of children who are damaged by poverty's insidious effects. Children, who lived in poverty during their early childhood, tend to have lower-than average academic performance that begins in kindergarten (age 4 to 5) and extends through high school (age 14 to 18), leading to lower-than-average rates of school completion (Law, Woo, Torre, & Wong, 2018). Poverty has also been seen as a reason of school drop-out. Inability to pay school fees, the costs of uniform, shoes, transport, stationary, added to the opportunity costs of what children might be contributing to household labor, eat away at meagre resources and push children from school (Dieltiens & Meny-Gibert, 2009).

On the other hand, a lack of education can cause poverty or a higher level of education can lift people from poverty. In developing countries, education is considered as a tool to combat poverty, thereby most poverty reduction policies these countries emphasize on the need for quantity and quality education (Omoniyi, 2013). One of the main reasons is to equip the citizens with learning skill, increase productivity, and competitiveness in the workforce market. Countries with strong vocational training programs are in a better position to avoid rising younger labor force unemployment, even in difficult times. Vocational

education and training at the secondary level can ease the transition from school to work while supplying employers with trained workers (Eichhorst, Rodriguez-Planas, & Schmidl, 2015).

The national survey of Minimum Basic Needs (MBN) of Thailand identifies five indicators of education dimension as follows: (1) children 3 to 5 years of age receive adequate care and preparedness for learning; (2) children 6 to 14 years of age receive at least 9 year of education; (3) children finished 9th grade attend 10th grade or equivalent; (4) household members who finished 9th grade and if do not have a job receive adequate vocational training; and (5) household member 15 to 59 years of age are proficient in reading and writing Thai language.

### 2.4. Economy

The context on this dimension revolves around the aspects of employment and income. The relationship between poverty and employment is evident in the form of generated income which enables workers to purchase goods and services necessary to meet basic needs. In developing countries, poverty is principally linked to underutilization of labor, which could be statistically observed in the form of open unemployment or massive underemployment (International Labor Organization: ILO, 2008). According to the International Labor Organization, under the underemployment condition, workers are forced to or voluntarily undertake any jobs regardless of pay rate and working conditions. While poor workers in rural areas are working poor (receiving less pay while working in a worse condition), the situation not only affects their income and purchasing power but also their health and welfare.

In Thailand, underemployment seems to associate more with poverty than does open unemployment, especially in the rural areas. The labor force survey (2019) indicates that Thailand has a total of 38.37 million persons in labor force, of which 37.30 million were employed, 0.35 million unemployed, 0.32 million inactive labor force, and 0.35 million underemployed. Among employment sectors, agriculture comprises of more than 40 percent of the country's total workforce (National Statistical Office, 2019). More specifically, in northeast region of the country, there are approximately 7.8 million people work in agricultural farming and majorly produce cash crops such as cassava, sugarcane, and rubber. While the crops production in this region have suffered from the bad weather condition, the farmers' incomes have often been impacted by the fluctuating crops price in both the domestic and the world markets. Over the past two decades, farmers in northeast region have not only struggled to maintain their quality of live but the average of their household debts has also doubled.

The national survey of Minimum Basic Needs (MBN) of Thailand identifies four indicators of economy dimension as follows: (1) household members aged 15 to 59 have jobs and income; (2) household members aged 60 or older have jobs and income; (3) average income of household per year; and (4) household has saving account.

## 2.5. Thai Value

Poverty can be defined not only in a material but also cultural and spiritual sense (Du Toit, 1996). For example, with the Buddhism influence, poverty can be defined as ‘bad karma’ (Sharma, 2010, p. 171). Although a response to poverty may vary depending on the context, religion not only offers ethical motives but also practical approaches to poverty reduction. Religion can influence moral consciousness and guide quality behaviors, such as kindness, willingness to assist, humanitarian purposes, generosity (Byers, 2014). Moreover, religion help decreases ‘low value’ behaviors such as violence, exploitation, corruption, discrimination against children and women (Olupona, 2009). The ethics and religious principles are potentially translated into charity activities such as zakat in Islam or “the obligation to give to the poor” (Olupona, 2009, p. xv), contentment in Buddhism that encourages the willingness to share resources with the poor (Premasiri, 1999, p.4).

In Thailand, Thai value reflects social norms and expectations, which cherish religious practice, family tie, and community engagement. The Community Office, Ministry of Interior, uses Thai value to indicate quality of life and happiness. In this respect, the Thai value considers ‘family and community’ as the vital sources of care and help, both financial and non-financial such as emotional support and access to opportunity. Thus, a person’s income or financial status is likely to be influenced by that of that person’s ‘high-value’ behavior, family and community.

In this research, the Thai value dimension consists of eight indicators as follows: (1) None of the household members consumes alcohol; (2) none of the household member smoke; (3) household member aged 6 years old or older perform religious practice at least one a week; (4) elders in the household receive adequate care from family and community; (5) disable household members receive adequate care from family and community; (6) chronic ill household members receive adequate care from family and community; (7) household take part in local or public work or volunteer; and (8) household happiness.

## 2.6. Assets (Property Ownership and Land Use)

A link between the ownership of assets and poverty is well established in the literature (Kubo, 2009; Kurosaki,

2006; Sawada, Kubo, Fuwa, Ito, & Kurosaki, 2006; Kajisa & Palanichamy, 2006; Kijima & Lanjouw, 2005; Lanjouw & Shariff, 2004). Asset ownership is a vital predictor of poverty. Asset ownership highly affects the levels of income and consumption, for example, in India (Kubo, 2009), Pakistan (Kurosaki, 2006). The benefit of asset ownership lies in ‘access to credit’ in which the assets can be converted (Kubo, 2009). This credit availability then can turn into a better opportunity to move out of poverty through investment in physical (i.e. land) and/or human capital (i.e. education) (Kubo, 2009; Kurosaki, 2006; Sawada et al., 2006). In this connection, the improvement in asset ownership is likely to enable higher education attainment of children in poor households. Furthermore, higher education attainment also increases the probability of the next generation to get a job outside the agriculture realm that often could yield higher pay.

In this research, the asset dimension consists of two indicators as follows: (1) household has residential property (house) on their own land and (2) household owns land for commercial use or agricultural use.

## 2.7. Empowerment

While sustainable development is essential for permanent poverty eradication, empowerment-focus on people as medium and objects of development has become the mechanism through which the sustainable development goals can be achieved (Singh, Titi, & International Institute for Sustainable Development (IISD), 2001). Practically, it does not suffice merely for the development goal to generate more jobs and improved income opportunities (ILO, 2018). The long-term goal of development must empower the people and is to build the capacity of communities to respond to changing environment. More specifically, the poor must be equally given opportunity and the power to develop, protect and sustain their livelihood. The empowerment process cannot be isolate from the economic and political realities at all levels. An effective empowerment must ensure an equal access to and control over resources, power to bargain and compete with other interest groups for a better share of resources and benefits, and political influence in resource distribution (ILO, 2008).

According to the New Global Multidimensional Poverty Index 2018 and align with the Sustainable Development Goals, empowerment has become a significant indicator in poverty measurement. Empowerment is defined as “the process of transforming existing power relations and of gaining greater control over the sources of power” (UNDP, 2004, p.12). An important source of power is resources. The more access and control over resources, the more power to make choices that improve life situation.

While there are numerous mechanisms that could

potentially yield the empowerment values, it is impossible to investigate them all in this research. As a pilot research design, this research therefore focuses on ‘network’ or ‘group’ as a mechanism increasing the power of a person to improve the livelihood. The benefit of network lies in ‘resources’ that become available only for network member. Being a network member then increase a person’s access and control over resources possessed by other members (Bourdieu, 1986; Flap, 1999, 2002; Flap & Völker, 2003; Lin, 1999, 2001; Portes, 1998). The resources can be both monetary and non-monetary, such as knowledge, emotional support, and opportunity. They are used to improve that person’s ability to achieve a certain goal such as facilitating growth and productivity and increase the negotiation and bargaining power.

In this research, we identified three indicators of empowerment dimension as follows: (1) household or household member is a current member of a local agricultural production group;

(2) household or household member is a current member of a trade group (marketing and sale); and (3) household or household member is a current member of a financial investment group.

## 2.8. Digital Literacy

Over the past decade, technology has become increasingly important in driving economy and shaping the global society. The rapid development of new technology and role it plays in the business world have mandated digital literacy to become one of the most valuable tools for lifelong learning. The influence of technology, social media, and online resources has become significant factors in education and workforce success. For example, the 2013 report by the New York City Comptroller’s Office and 2011 Microsoft Infographic attests that children from families with home computers, electronic devices, and access to internet have better chance of attending college, while adults equipped with higher technological skills are more likely to manipulate the job market.

Giving a precise definition of digital literacy is challenging as the term is relatively new and contextualized. The definition of digital literacy seems to vary in different frameworks and practices. It often involves a combination of common skills such as: access, manage, understand, integrate, communicate, evaluate, and create digital information and materials (Ala-Mutka, 2011; Gilster & Gilster 1997; Jongsermtrakoon & Nasongkhla, 2015; Phuapan, Viriyavejakul, & Pimdee, 2016; Wilhelm, 2004). European Communities (2007) highlights digital literacy as the skills required to achieve digital competence, such as the use of computers and the ability to retrieve, assess, store, produce, present and exchange information, and to

communicate and participate in collaborative networks via the Internet. In Thailand, the Department of Education of Thailand (2006), however, adds a social aspect into the digital literacy term. Digital literacy therefore comprises of four core components including technology, critical thinking, collaborative working, and social awareness skills. This means that people with higher digital literacy could have better opportunity in employment, getting a better job, or a better chance to succeed in their entrepreneurial career.

In this research, we identified five indicators of digital literacy dimension as follows: (1) access to smart phone; (2) access to the internet access; (3) access to social media (Facebook, Line, Instagram, WhatsApp, etc.); (4) access to financial Application (Online Banking); and (5) access to e-commerce platforms (Shopee, Lazada, etc.)

## 3. Methodological Framework

### 3.1. Linear Regression

Data analysis was performed using a simple linear regression. i.e. regression of income per head over 41 indicators of 7 dimensions of basic minimum needs. The significance of each indicator will be determined based on 0.15, 0.10. and 0.05 significant levels respectively. To ensure that the regression capture the significance of each indicators accurately, we used 15 multivariable regressions as follows

**Table 1:** Regression Models

	Dimension	Number of Indicators
Model 1	Health	7
Model 2	Living Standard	7
Model 3	Education	5
Model 4	Employment	3
Model 5	Thai Value	8
Model 6	Assets & Land Right	2
Model 7	Empowerment	3
Model 8	Digital Literacy	5
Model 9	Health, Living Standard, Education	19
Model 10	Health, Living Standard, Education, Employment	22
Model 11	Health, Living Standard, Education, Employment, Thai Value	30
Model 12	Health, Living Standard, Education, Assets & Land Right, Empowerment, Digital Literacy	32
Model 13	Health, Living Standard, Education, Employment, Assets & Land Right, Empowerment, Digital Literacy	35
Model 14	Health, Living Standard, Education, Employment, Thai Value, Assets & Land Right, Empowerment, Digital Literacy	40
Model 15	Consists of indicators that are appeared significant in Model 1 to Model 14	9

The general form of regression model is written as follow:

$$y = f(x_1, \dots, x_{40}) = c_1x_1 + c_2x_2 + \dots + c_{40}x_{40} \quad (1)$$

Where:

y: a dependent variable of household income per head in Thai Baht

x<sub>1</sub>: an independent variable of Indicator 1

x<sub>2</sub>: an independent variable of Indicator 2.

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x<sub>40</sub>: an independent variable of Indicator 40

c<sub>1</sub>, ..., c<sub>40</sub> are coefficient values

### 3.2. Income Confidence Intervals Inference

In order to measure career-income inequality in the area, the Estimation Statistics framework (Ho, 2019) was deployed to conduct the analysis. The framework was developed based on boot strapping principle (Efron, 1992). In this work, there are five types of careers: company employee (EM), farmer & agriculture-related careers (AG), freelance (Freelance), unemployed person (UNEM), and others (Others). The purpose of this analysis is to find income confidence intervals of all careers as well as gaps of income between different careers in the term of income-mean-difference confidence intervals. The data from all three districts were used to conduct the analysis. The Bias-corrected and accelerated (BCa) bootstrap (Efron, 1987)

was used to infer confidence intervals of means of incomes as well as confidence intervals of mean difference between pair of different careers. A significance level of confidence intervals was set at 0.05. A number of times of sampling with replacement was 1,000 rounds.

### 4. Data

This study surveyed a total of 187 households (72 households in Khok Po Chai district, 52 households in Nam Pong district, and 63 in Sam Sung district). Participants are heads of households or main income sources of the families. Family size, in terms of household members, ranges from 1 person to 12 people with an average of 4 household members per family.

The survey result (see Table 2) shows that rice farming, freelance, and other (unidentified) are the three major income sources in Khok Po Chai district (account for 38%, 20%, and 17%, respectively). While freelance is the major income source in Sam Sung district and accounts for 59% of 63 surveyed households, rice farming and self-employed & other ranked second and third major income sources (account for 17% and 6%, respectively). In Nam Phong district, freelance appears as the main income source and accounts for 27% of 52 surveyed households, while rice farming is the second major income accounts for 21%, and full-time employment is the third major source of income which accounts for 8% of the surveyed households.

**Table 2:** Sources of Income of Surveyed Households from Three Districts

Sources of Income	Khok Po Chai		Sam Sung		Nam Pong		Total	
	hh	%	hh	%	hh	%	hh	%
Rice Farming	27	38%	11	17%	11	21%	49	26%
Freelance, self-employed, other	4	6%	4	6%			8	4%
Freelance	14	20%	37	59%	14	27%	65	35%
Freelance & agriculture			1	2%			1	1%
Freelance & rice farming	2	3%			1	2%	3	2%
Retired	1	1%					1	1%
Full-time employed	2	3%	2	3%	4	8%	8	4%
Full-time employed & free-range					1	2%	1	1%
Full-time employed & rice farming					1	2%	1	1%
Full-time employed & other					1	2%	1	1%
Unemployed	9	13%	5	8%	18	35%	32	17%
Unemployed& rice farming					1	2%	1	1%
Other	12	17%	3	5%			15	8%
Total	71	100%	63	100%	52	100%	186	100%

(hh): household members.

(%): percentage in sources of income

The survey data shows annual household income across three districts ranges from 5,000 baht to 468,000.00 baht,

while the annual income per head ranges from 875 baht to 234,000 baht. The highest annual household income in

Khok Po Chai district is 300,000 and the lowest annual household income is 7,000 baht. In Sam Sung district, the highest annual household is 468,000 and the lowest annual household income is 5,000 baht. The highest household income in Nam Pong district is 540,000 and the lowest annual household income is 20,000 baht.

Among the three districts, Sam Sung district has the highest annual household income per head of 24,961.05 bath; Nam Pong district has the second highest annual household income per head of 16,075.42 baht; and Khok Po Chai has the lowest annual household income per head of 15,871.37 baht.

## 5. Results

### 5.1. Regression Analysis

The data analysis results were obtained through the following steps: First, simple linear regressions were conducted for model 1 to model 14 as described in table 1. The purpose was to identify relationship between indicators listed on each dimension and the annual income per head across three districts. Due to the constraint in numbers of observation, we tested each model separately, one by one, and that the significant level was expanded from 0.05 to 0.20 (or between 5 percent and 20 percent). Second, we used the significant indicators found within 20 percent significant level from the regression of model 1 to model 14 to construct model 15. Third, we performed simple linear regression on model 15 and limited the significant level to 15 percent level or (p-value < 0.15).

From the regression results of model 1 to model 14, we identified 13 indicators that appeared significant within 20 percent significant level. These include: Q7, Q10, Q13, Q18, Q23, Q25, Q26, Q28, Q29, Q32, Q33, Q34, and Q37. Regressing these 13 indicators against annual household

income across three districts, we found 9 indicators appeared significant within 15 percent significant level. Among these 9 indicators, 4 indicators namely Q23, Q25, Q26, and Q29 were significant within 10 percent significant level (see Table 4).

**Table 3:** Regression of Model 1 to Model 14

	Significant Indicators	Coefficient	p-value
Model 1	Q7	6130	0.162
Model 2	Q10	10515	0.140
	Q13	5157	0.192
Model 3	Q18	10740	0.133
Model 5	Q25	-8809.3	0.060132*
	Q28	-7874.5	0.076274*
	Q29	-9005.8	0.017448
Model 6	Q32	9082	0.06311*
Model 7	Q34	5955	0.0958*
Model 8	Q37	-8220.12	0.182
Model 9	Q7	6021.9	0.198
	Q10	10045.7	0.179
Model 10	Q10	11282.7	0.136
	Q18	10412.73	0.161
	Q23	6061.87	0.149
Model 11	Q18	11692.6	0.1135
	Q25	-7934.9	0.1101
	Q29	-9000.9	0.0276***
Model 12	Q32	7644.4	0.159
Model 13	Q18	10043.2	0.1894
	Q32	8385.5	0.1217
Model 14	Q18	11273.14	0.1389
	Q23	7539.32	0.1080
	Q26	-8199.64	0.0827*
	Q28	5867.39	0.1987
	Q29	-8141.18	0.0555**
	Q33	-5579.04	0.1596

**Table 4:** Regression Result of Model 15

Indicators	Dimension	Significant Indicators	Coefficient	p-Value
Q7	Health	Person(s) aged over 6 exercise at least 3 times a week, 30 minutes each time	6225.81	0.1441
Q18	Education	Unemployed person(s) received only 9 years of compulsory education and a job training	10872.06	0.1168
Q23	Employment& Income	Household with saving	6646.83	0.0909*
Q25	Thai Value	No smokers in the household	-7869.46	0.0365***
Q26	Thai Value	Person(s) aged over 6 conduct a religious practice at least once a week	-7688.83	0.0630*
Q28	Thai Value	Disable person(s) received care from family, community, government, or private company	6328.87	0.1253
Q29	Thai Value	Person(s) with chronic illness received care from family, community, government, or private company	-7146.60	0.0607*
Q33	Assets & Land Use	Owning the land from which income generated	-5115.96	0.1451
Q34	Empowerment	Membership of a agricultural group	5368.07	0.1519

Results in Table 4 show that indicators Q7 (of health dimension), indicator Q18 (of education dimension), indicator Q23 (of employment & income dimension), indicator Q34 (of empowerment dimension), and indicator Q28 (of Thai value dimension) have positive impact on income; indicator Q25, Q26, and Q29 (of Thai value dimension) and indicator Q33 (of assets & land use dimension) have negative impact on income. However, only indicator Q25 (of Thai value dimension) is significant at 5 percent level

### 5.2. Income Confidence Intervals Inference

The bootstrapping was performed by sampling incomes of households of each career type with replacement to estimate the 95% confidence intervals of mean of income categorized by careers. Table 6 illustrates the 95% annual income-mean confidence intervals of household w.r.t. careers. The incomes of others and unemployed people in the area can be as low as 33,000 THB per year (1,000 USD/year), while company employees can have their annual income from two to eight times of others and unemployed people. This result indicates the inequality of career income in the area.

**Table 5:** Mean confidence intervals of household incomes categorized by careers

Careers	95% confidence intervals of income means		Income means (THB)
	Lower bound (THB)	Upper bound (THB)	
Others	25,393.44	62,514.49	36,858.82
Unemployed person	32,352.94	67,131.73	44,425.00
Freelance	51,377.98	83,153.40	63,660.00
Agriculture career	54,960.74	102,163.12	71,934.62
Company employee	77,474.99	240,576.78	131,560.00

The result of mean-difference confidence intervals of annual incomes between pairs of careers is in Table 7. A mean-difference confidence interval can represent a gap of income between different careers. Let us consider a mean-difference confidence interval of career *A* minus *B*. If a lower bound of a confidence interval, which has a value *L* is high, it implies that a career *A* has a higher income than another career *B* at least *L*. Based on table 7, the lower bound column suggests that many career pair (e.g. AG minus Others) has a positive value.

**Table 6:** Mean-difference confidence intervals of household incomes categorized by careers

Careers	95% confidence intervals of income mean difference		Income means (THB)
	Lower bound (THB)	Upper bound (THB)	
UNEM minus Others	-14,715.09	31,752.94	7,566.18
Freelance minus Others	3,857.27	49,458.11	26,801.18
AG minus Others	14,468.67	69,046.20	35,075.79
EM minus Others	32,026.34	18,6897.82	94,701.18
Freelance minus UNEM	-1,747.65	41,935.94	19,235.00
AG minus UNEM	5,832.33	58,964.54	27,509.62
EM minus UNEM	22,608.50	176,079.88	87,135.00
AG minus Freelance	-15,600.75	37,329.04	8,274.62
EM minus Freelance	-942.71	147,691.80	67,900.00
EM minus AG	-10,207.50	144,055.31	59,625.38

According to the income means column in Table 7, it suggests that, on average, the gaps of incomes between different careers can range from 7,500 THB (250 USD) to 60,000 THB (2,000 USD). This result suggests that there are many careers that actually have the real income gaps.

## 6. Conclusion

The results show a significance level of income-influence of one indicator from Employment and Income dimension

(namely household has some sort of saving), and of three indicators from Thai Value dimension (namely nobody in the household smokes, everyone in the household aged 6 years old and older perform religious practice at least once per week, and person/s with chronic illness in the household was/were given a good care by the family). For the sake of statistical consistency, our discussion will not cover indicators outside of 10 percent significant level.

The principle of economic of scale argues that household expense per head decreases as the family size increases. This means that a higher number of family members leads



to less expense per head on food (National Economic and Social Development Board, 2004). This finding however contradicts with that of Siamwalla and Paopongsakorn (2013), who found that from 1986 to 2013, when the average household size in Thailand decreased, the families were saving more and the number of families with no saving decreased from 48% to 25%. Their finding therefore suggested that family saving negatively correlates with the household size. A significant number of studies have shown that family saving associates with poverty. Specifically, in developing countries, family saving could be impacted by the number of children in the family. In the Philippines in 1992, for instance, the risk of poverty associated with increased number of children are 44% to 50% for 1 child and 60% to 78% for those with 5 children or more. Subsequently, households spend up to 10% of their total income to raise 1 child, 18%, and 26% to raise 2 children and 4 children, respectively (Greenspan, 1992). In 1993, Bayudan-Dacuycuy and Lim (2013) found similar evidence that the number of dependent children positively affects chronic poverty in the Philippines.

The significant income-influence of the three indicators of the Thai value dimension associate with health aspect of poverty. Smoking or tobacco use is not only considered as the household income burden but also leading risk factor of health issues. In 2010, the World Health Organization estimated that out-of-pocket health expenditures had caused 100 million people worldwide to live under poverty line (defined by low food expenditure) annually where much of these expenditures came from the treatment of non-communicable diseases (Global Tobacco Economics Consortium, 2018). In Thailand, Jitnarin, Kosulwat, Rojroongwasinkul, Boonpradern, Haddock, and Poston (2011) found that socioeconomic factors, especially education level and occupational class, have a strong influence on smoking behavior in Thai adults.

Systematic measurement of linkage between religion and poverty remains ambiguous worldwide. Although the two concepts could be associated as demonstrated earlier in this report, one could still argue that each is concerned with different human spheres of existence-human earthly existence vs. spiritual existence. According to Bayers (2014), there are three functions of religion related to poverty. First, religion directs human thought from material concerns to spiritual concern; second, religion ties societies together and encourage them to fight against poverty; third, religion fosters attitude of willingness and generosity within society (p.4). Although these connections may appear at a consciousness level, the scale of their effects is difficult to be systematically measured. In this survey, we found negative correlation between time spent in religious practice and income. The rationale of such relation in this case is therefore unclear due to constraint in sample size and a lack

of data to further investigate the true nature of the religious practice. For instance, one general purpose of religious practice could be to give and let go, therefore, the benefit of religion cannot be garnered as income gain but as an ability to articulate collective vision of empowerment (Offutt, Probasco, & Vaidyanathan, 2016).

In conclusion, this survey found that poverty indicators in Khon Kaen remain centered around the aspects of Health and Employment dimensions. While an increase in changing of family structure of the Thai society over the past three decades reduces the family size, household saving substantially increases over the years. The effects of Health dimension in poverty, on the other hand, appears on other dimension such as Thai value which include (1) a bad habit of the head of household (smoke or alcohol consumption) that links with illness and disease, (2) religion practice, and (3) chronic illness. Lastly, there are income gaps of different careers in the area, which suggests the issue of income inequality.

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