Int. J. Advance Soft Compu. Appl, Vol. 9, No. 2, July 2017
ISSN 2074-8523

Investigation of Poverty Indicators for Designing Case Representation to Determine Urban Poverty

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Abstract

Poverty in Malaysia is a controversial economic issue. Although poverty alleviation strategies in Malaysia have been acclaimed success by United Nation Development Programme (UNDP, 2013), new form of poverty emerged in urban area as a result of rapid economic growth and development. Poverty is a multifaceted phenomenon and different societies have different perceptions of poverty. These will led to uncertainty in determining of poverty. Most of welfare institutions in Malaysia measure poverty from the monetary perspective using monthly income or expenditure. In practice, conventional institutions such as Jabatan Kebajikan Masyarakat Malaysia (JKMM) use monetary approach in determining poverty through the Poverty Line Income (PLI). While, Islamic institutions adopt the monetary approach in determining poverty using Had Al-Kifayah (HAK). The objective of this paper is to explain the concept and analyze the uncertainty factors that have contributed to the incidence of poverty in urban area using PLI and HAK method. This study would highlight the similarities and differences of both the methods. A survey aided by a structured questionnaire was carried out on 300 selected households in the state of Kuala Lumpur and 150 household datasets are obtained from Department of Zakat, Islamic Center, UTM, Johor. This empirical study will able to use in designing case representation for case-based reasoning that will be implemented in future work.

Keywords: *Urban Poverty, Multidimensional, Uncertainty, Conventional Measure, Islamic Measure, Poverty Line Income, Had Al-Kifayah.*

1 Introduction

The poverty issue of the general population has remained a big challenge since human civilization. Poverty is still a continuous issue in Asia and is on the rise in some countries which in turn is further worsening the access of the poor to the economic opportunities through which they could build up their assets and enhance income in order to come out of the poverty cycle [1]. The rapid growing countries like Malaysia have made remarkable progress in the field of economics and have resolved the issue of inequality, gender disparity and financial exclusion on a wider scale. The incidence of poverty has alleviated at large but rapid growth, rural urban migration and urban expansion has posed new challenges of urban poverty on rapid growing economics [2].

Poverty is a multifaceted phenomenon and different societies have different perceptions of poverty. Basically, poverty is often considered as lacking or deficiency of economic resources. For many years this situation is explained through income perspective. However, poverty is no longer objectively defined but exists in a multidimensional condition [3]. In Malaysia, poverty is commonly determined by using poverty line based on monetary approach which assesses on minimum consumption levels for survival. A household is considered poor if its income falls below that line. However, monetary often lacks on providing deprivations in other dimensions. On the other hand, the multidimensional poverty measure considers deprivations experiences of poor people such as poor health, income deficiency, insufficient living standard and inadequate education and how they interrelate.

This study sees Malaysia has adopted two guidelines in determining the poverty whereby classification of poor is determined through conventional and Islamic perspectives and poverty classification is drawn into three classes namely:

i. Needy or hard-core poor – one who has neither material possessions, one who are suffers and has no means to sustain his or her daily needs.

ii. Poor – one who has insufficient to meet his or her basic needs.

iii. Non-poor – one who has sufficient to meet his or her basic needs.

In poverty determination, there has a complexity to understand the dimensions experienced by poor households which it is often changed and uncertainty. Therefore, this paper will examine and analyze the present poverty measurement practiced by conventional and Islamic institutions in Malaysia and propose non-monetary factors that relate to multidimensional phenomena of urban poverty based on household data collection. This paper is organized as follows. The next section outlines the concept of two difference poverty measurement methods whereas the methodology undertaken in this study is explained in section 3. Section 4 presents the empirical results of the study. Finally, the conclusion of the study is highlighted in section 5.

2 Poverty from Different Perspectives

The elimination of widespread poverty is at the core of all development problems and in fact, for many people define the principal objective of development policy. Poverty needs to be measured more precisely to provide a meaningful understanding of how much progress has already been made, how much more remains to be achieved, and how to set incentives for government officials to focus on the most pressing needs. Malaysia, like most of the developing countries define poverty in one-dimensional way, which is aggregates all household achievement into a single variable of income or consumption level. In the past, most welfare institutions in Malaysia uses the concept of the monetary approach to measure poverty through the conventional poverty line income (PLI) method and recently, Islamic organizations such as zakat institutions use *had al-kifayah* (HAK) method using total necessities of a household from an Islamic perspective. The similarities and differences between conventional and Islamic approach are described in details as below.

2.1 Conventional perspective

Poverty in Malaysia is commonly conceptualized and operationalized from the monetary approach perspective. The data presented by EPU is based on the definition and measurement of poverty from the perspective of income using the concept of poverty line income (PLI). The PLI or commonly known as the poverty threshold in Malaysia is determined by the EPU, Prime Minister's Department. Individuals or households are under the poverty line will categorized as poor. Generally, the PLI is different between rural and urban area in Malaysia which is the PLI is higher in the urban area compared to the rural as tabulated in Table 1.

Table 1: PLI by regions in Malaysia, 2014 (RM per month)

Region	Poor		Hardcore Poor	
	Household	Per Capita	Household	Per Capita
Peninsular Malaysia	930	230	580	140
Urban	940	240	580	140
Rural	870	200	580	130
Sabah	1,170	250	710	150
Urban	1,160	260	690	150
Rural	1,180	250	760	160
Sarawak	990	240	660	160
Urban	1,040	250	700	160
Rural	920	240	610	150

Source: Economic Planning Unit (EPU)

Currently, PLI takes into account the minimum requirements of household for two major components, which are food and non-food items. Food items are based on the Recommended Dietary Allowances, whereby basic needs of households are

based on demographic factors such as gender and age. Meanwhile, the non-food items are including clothing and footwear, house ownership as well as transportation. These are based on the expenditure pattern by the lowest 20 percent households in the Household Expenditure Survey 2014/2015. The determination of PLI 2014 based on food and non-food items are listed in Table 2.

Table 2: Determination of PLI 2014

No.	Items
1.	FOOD ITEMS 1. Based on the Recommended Dietary Allowances (RDA). 2. Necessity of household based on demographic factors such as age and gender.
2.	NON-FOOD ITEMS 1. Based on the expenditure of the lowest 20 percent household in the Household Expenditure Survey 2014/2015. 2. Consideration of prices at different states and stratum. 3. Categories of goods: a. clothing and footwear b. house ownership c. utensils d. transportation and communication e. other goods and services

Source: Economic Planning Unit (EPU)

Economists [4] have argued that the current monetary approach is not able to reflect the multidimensional of poverty. Hence, it is important to conceptualize poverty in a more realistic way in Malaysia compared to the present approach which is widely used in policy and decision making [5]-[7]. The combination of monetary and non-monetary based measures would be able to improve on the measurement and understanding of poverty in Malaysia, making the distribution on welfare to the poor more accurate [8].

2.2 Islamic perspective

Islamic institutions in Malaysia play a diversity of socioeconomic roles such as poverty alleviation. To perform this role, these institutions face a major task in identifying the poverty group. Most of these institutions measure and operationalize poverty from the monetary perspective using variables such as income, expenditure or consumption. According to Yusuf Al-Qardawi [9], Islam outlines the self-sufficiency for an individual as the availability of basic food, drinks, shelter and other basic needs as defined by the society in which he or she belongs to. In addition, Al Sabai [10] explains that the minimum living standard is inclusive of having family, housing and transportation. Failure to attain this stipulated needs qualifies individuals to be poor. Poverty is not only complex and multidimensional in nature, it goes beyond the notion of income and encompasses social, economic and political deprivations.

Recently, Islamic institutions used the monetary approach adopted from conventional measure in measuring poverty through *had al-kifayah* (HAK)

method using total necessities of a household from Islamic perspective. HAK is usually calculated by each of the Islamic institutions themselves. Generally, HAK is a rate (economic viability) which should ensure the continuity of the life of an individual as well as his or her dependents [11]. Table 3 shown the determination of *had al-kifayah* of every individual in more details.

Table 3: Determination of Had Kifayah in Kuala Lumpur

Category of Household	Specification	Basic Needs	House Payment Rates (RM)	Free House Rates (RM)
Head of household	- Husband/wife - Single husband/wife - Alone - Guardian	- House - Food - Clothes - Medical -Transportation	1000	550
Adult	- Husband/wife under dependency of head of household who is working - Dependent of children/ working children that living together	- Food - Clothes - Medical -Transportation	280	
	- Husband/wife under dependency of head of household who is not working - Parents who must be remunerated - Dependents of children that age above 18 y/o who is not working/ schooling	- Food - Clothes - Medical	210	
Adult who further study	- Dependents aged 18 y/o and above who study in IPT	- Food - Clothes - Medical - Education	250	
Teens and children who in school	- Dependents age between 13-17 y/o and attend school	- Food - Clothes - Medical - Education	270	
	- Dependents age between 7-12 y/o and attend school		240	
	- Dependents age between 5-6 y/o and attend school		220	
Children who is not in school	- Dependents age between 5-17 y/o and not in school	- Food - Clothes - Medical	210	
	- Dependents under the age of 4 y/o and not in school		200	
Additional deprivation				
Disabled dependent			250	
Intensive care of chronic disease			250	

Source: Majlis Agama Islam W.P. Kuala Lumpur (MAIWP)

3 Methodology

3.1 Conceptual framework

The multidimensional poor household evaluation is measure based on the headcount, average poverty gap, adjusted headcount and adjusted Foster-Greek-Thorbecke calculations. The formula for these measure are as follow:

(a) Adjusted headcount ratio, *M0*:

$$M0 = H \times A$$

(b) Adjusted poverty gap, *M1*:

$$M1 = H \times A \times G$$

(c) Adjusted FGT, *M2*:

$$M2 = H \times A \times G2$$

where,

$H = (p1 + p2 + p3 + ...) / P$

$A = (a1 + a2 + a3 + \ldots) / P$

$G = (g1 + g2 + g3 + \ldots) / P$

H = headcount

p = poor household

P = total of the population in particular area

A = average deprivation of the poor

a = total poor household

G = average gap across all dimensions of the poor

The classification of poverty has been divided into three categories namely needy, poor and non-poor according to Poverty Line Income (PLI) and *Had Al-Kifayah* (HAK). Based on PLI, the household with monthly income below the food poverty line which is income rate is between RM0 until RM580 was consider as needy. Next, the household with a monthly income below the poverty line which is income rate is between RM581 until RM940 was considered as poor. Meanwhile, the household with monthly income above RM940 was considered as non-poor.

According to HAK, the person (head of the household) who has neither material possessions nor means of livelihood, one who suffers and has no means to sustain his/her daily needs and only obtained a monthly income less than 50% of the requirements to cover the basic needs of household was considered as needy. Next, the person who has job or business that can only meet some basic needs but

not enough for him/her and those under his/her charge and obtained 50% of monthly income or more but not to meet real basic needs of household was considered as poor. Finally, the person who has obtained 50% of monthly income or more and meet real basic needs of household was considered as non-poor.

3.2 Data collection

The households data obtained from data collection are carried out in January and February 2016. The targeted area is an urban region called Bandar Tasik Selatan, situated in Kuala Lumpur and Johor Bahru, Johor. Kuala Lumpur is an urban area form the most developed and economically fastest growing region in Malaysia followed by Johor Bahru. A total of 300 questionnaires were distributed to the targeted households around Bandar Tasik Selatan. The open and close-ended questionnaire is designed with the specific aim to collect data that allows a better specification and empirical testing of vulnerability to multidimensional poverty. Respondents were asked to provide personal information such as their gender, age and educational attainment, job status and households size. Specific questions pertaining to social and economic indicators such as income, type of employment and non-income wealth were also obtained. Then, data were run through Microsoft Excel for analyzing survey questionnaire. While in Johor Bahru, a total of 150 household datasets obtained from Department of Zakat, Islamic Center, Universiti Teknologi Malaysia. In details, the data taken from the zakat department is consists of student's household data which has received financial aid from the religious authorities in Johor. 200 datasets from both data source were selected from the sampling unit comprising of past and present recipients of aid by the religious authorities in Kuala Lumpur and Johor.

4 Empirical Results

This quantitative study use data derived from a targeted survey of households in Kuala Lumpur and datasets obtained from Johor Bahru. The population in this study is Muslim poor and destitute households. The data comprised on a variety of household well-being issues gathered through structured questionnaire and recorded data with head of household or other knowledgeable members. It delves on household's economic, social and demographic data using simple random sampling technique. A representative's sample was selected using proportionate stratified random sampling technique with the household heads as respondents. 200 respondents were selected from the sampling unit comprising of past and present recipients of aid by the religious authorities in Kuala Lumpur and Johor.

Next section provides descriptive analysis for the variables involved in this study. All of the variables considered have quantitative value.

4.1 Descriptive statistics

In the initial stage of analysis data for data collection, this study used 100 samples of households data derived from datasets in Kuala Lumpur specifically household's data in Bandar Tasik Selatan. This sample was selected using random sampling technique. In this study, there are two guidelines used in determining urban poor classification namely conventional and Islamic approach. Therefore, this study compared the classification of poverty from conventional and Islamic expert domain evaluation. Before interpreting the results from both approaches, this section provides descriptive analysis for the variables involved in this study. All of the variables considered have quantitative value. Table 4 shows the descriptive analysis of 100 household's data collection in Kuala Lumpur in general.

Table 4: Descriptive analysis of household data collection

Variable	Mean	Min	Max	Std. Dev
Monthly income	1627.40	750	4192	677.64
Education years	15.65	0	21	2.29
No. of income earner (s)	1.03	0	2	0.26
Dependent expenditure	1538.46	714	4587	700.65
Household population	6.19	3	13	1.76
Disabled dependent	0.15	0	3	0.46
Extensive care dependent	0.15	0	2	0.48

From the table above, the data on the monthly income variable shows the majority of the families had an average monthly income of RM1627.40. The average years of education of the heads of household were rightly skewed at an average of 16 years of education. This means that most of the heads of households finished their high school studies before starting a family or earning money. Most of the families had one breadwinner to support the family. The dependent expenditure for most of the families was RM1538.46 per month, catering for three persons to a maximum of thirteen persons per household. A minority of household had disabled dependents and/or extensive care dependent (s), which would add to the household's monthly expenditure.

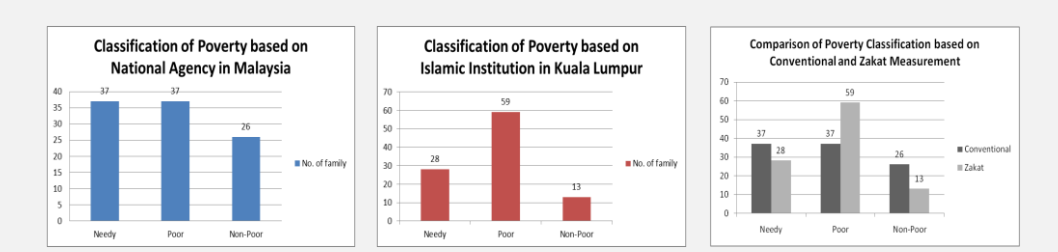
The standard deviation is a measure of variability; it is not a measure of central tendency. Datasets that are highly clustered around the mean have lower standard deviations than datasets that are spread out. The large standard deviation value for the monthly income variable was RM677.64 and the dependent expenditure variable was RM700.65 show that the distribution of income for each household was varied. On the other hand, the number of income earner variable, disabled dependent variable and the extensive care dependent variable showed a highly clustered dataset whereby the number or persons involved was limited from one to

two persons only. Meanwhile, the standard deviation for the education years variable and the household population variable were intermediate values at 2.29 years and two persons respectively.

4.2 Uncertainty and various cases in determining poverty

According to objective in this study is to identify the indicators that affecting urban poor focusing on multidimensional deprivation that experienced by poor themselves. The classification of poverty by using two guidelines namely conventional and Islamic approach was illustrated in Fig. 1. The 100 of household data from Kuala Lumpur was classified into poverty class namely needy, poor and non-poor. The comparison between two approaches of guideline was indicated much difference in determination of poverty especially amongst the poor and needy class. Therefore, this study will standardize both measurement guideline of poverty in multidimensional perspective in future work. Fig. 2 presented in more detailed of variables contributed in urban poor.

From the data presented in the graph, it has shown that the household monthly income is affected by the number of income earners as well as their education years/level of household head. Similarly for the dependent expenditure variable which affected by the number of household population. Regarding to monthly dependent expenditure there was another important variables named as sub-variables would involved in calculation of household expenditure which is food and beverage, loan, school expenditure, cost to school, electric, water and telephone bills and also other expenditure that household needs to cover. The variables namely, disabled dependent and extensive care dependent also involved in totaling of household expenditure.



(a) (b) (c)

Fig. 1: Histogram of poverty classification based on conventional and islamic institution

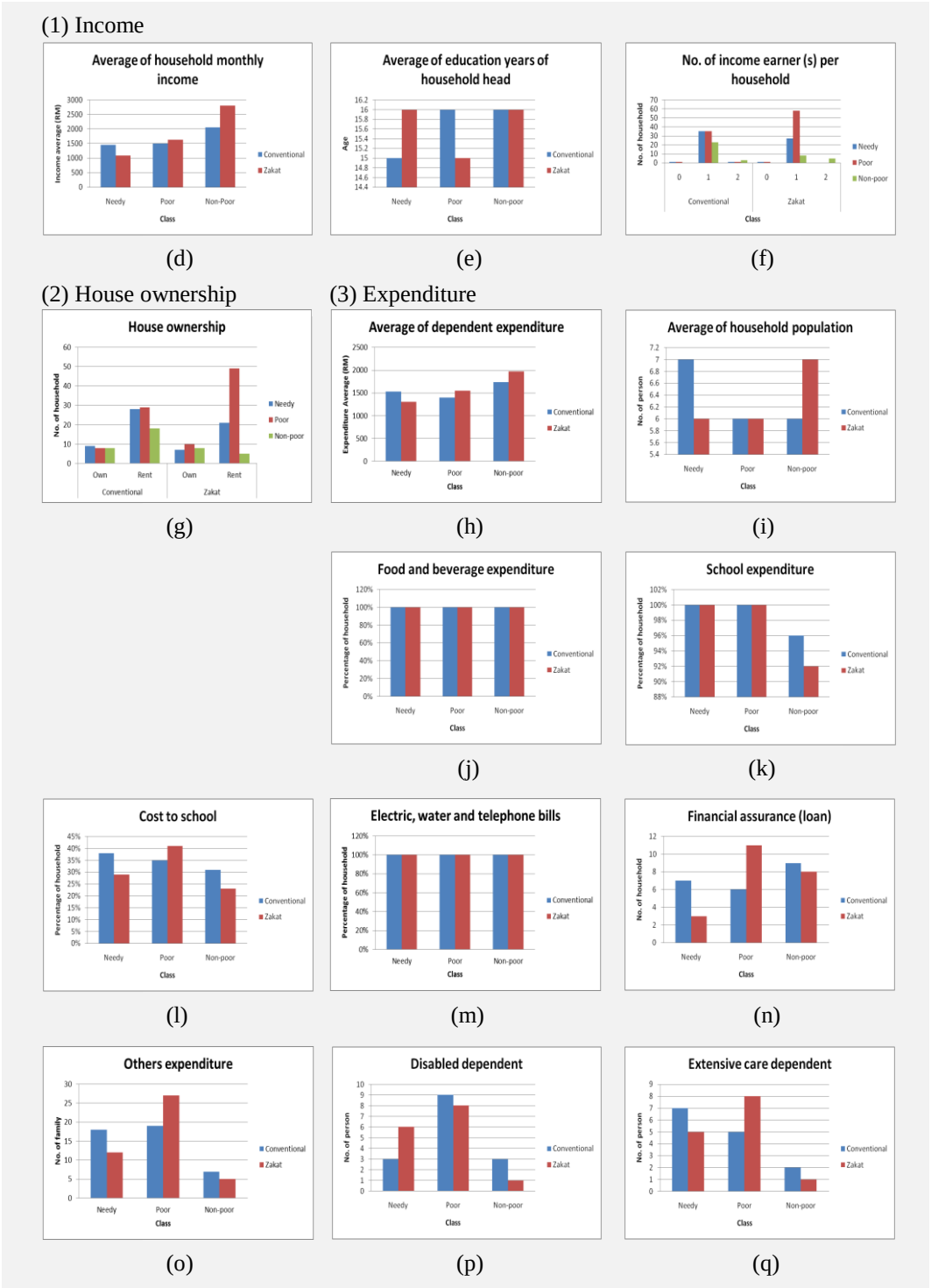
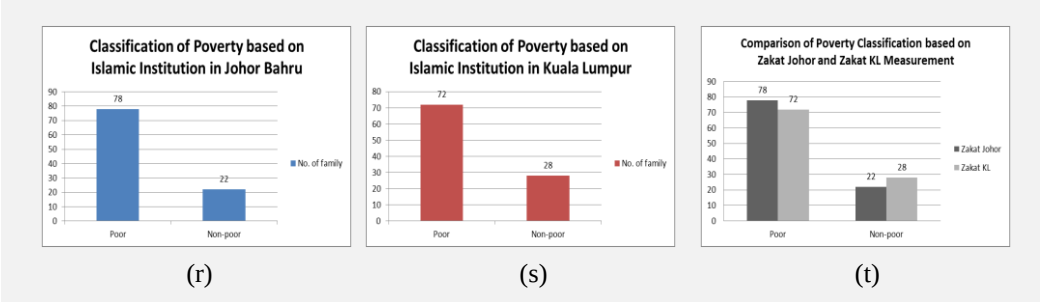


Fig. 2: Histogram of variables from conventional and islamic poverty measure

Fig. 3 was illustrated the classification of poverty by using only Islamic approach specifically the classification of poverty was used guideline from Islamic institution in Kuala Lumpur and Johor. According to our study on Islamic approach, it also has contributed to the uncertainty factor where state, urban and rural area in Malaysia have used different value of *had kifayah* in the determination of individual or household as poor or non-poor. This analysis used 100 of household data from Johor Bahru. Some variables can not be obtained because the available data are limited and difficult to access information due to the lack of data-sharing mechanisms.

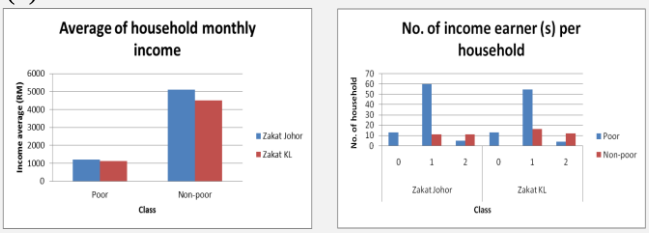
From the data shown in the graph, the comparison between two Islamic guidelines from different state was indicated small difference in determination of poverty. The variables of income and dependent expenditure have shown significant value between poor and non-poor. Here, it can be concluded the result from data analysis shown the uncertainty and various variables when using different methods.



(r) (s) (t)

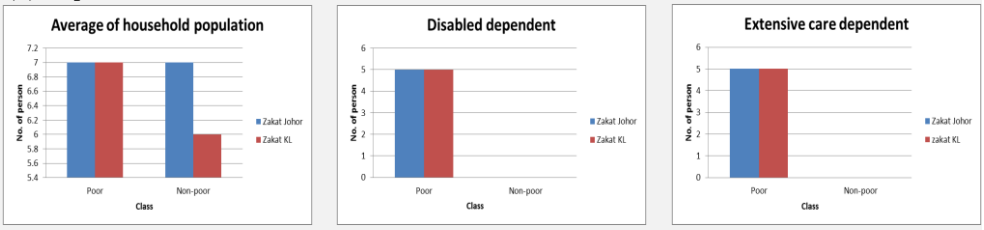
Fig. 3: Histogram of poverty classification based on islamic institution in Johor and Kuala Lumpur

(1) Income



(u) (v)

(2) Expenditure



(w) (x) (y)

Fig. 4: Histogram of variables from two different islamic poverty measure

4.3 Determining poverty using artificial intelligence

Recently, the application of artificial intelligence approaches make ways in economic welfare field, revealing on the fusion studies between both. Compared to the conventional econometrics approach, the artificial intelligence is more flexible towards changes happened in the model. Therefore, in this section, there will be details explanation of the artificial intelligent approach that currently used in many studies on household welfare and comparative study of case-based reasoning (CBR) with others artificial intelligent techniques that will be focused in the future work as a part of the research objectives. The explanation as tabulated in Table 5.

Previously, there are a huge number of researches that have used the fuzzy logic method to determine poverty for welfare disbursement such as multidimensional fuzzy index of poverty that calculate four indicators of individual from data survey of households by [31], fuzzy subset theory in evaluation of individual and population deprivation by [32], fuzzy poverty index based on enhanced headcount ratio index by [33], development of fuzzy poverty index for unidimensional and multidimensional poverty measurement by [34] and more. Most previous study used difference definition of poverty to predict important indicators contributed in poverty according to region and applied difference types of artificial intelligence in the measurement of poverty.

Table 5: Related study of artificial intelligence

Artificial Intelligence Approach	Author	Aim/ Concept
Fuzzy logic based	Hidayah Zakaria et al. (2015)	Used multi-layer fuzzy to determine the welfare candidate eligibility among urban households by using multidimensional poverty indicators as follows: a) Household monthly income b) Education attainment of household head c) Number of income earners in each household d) Dependent expenditure for food consumption within a household e) Household population f) Disabled dependent in household population g) Extensive care dependent(s) in household population
	Mahmod Othman et al. (2010)	Used fuzzy set theory to calculate poverty index to assess the living condition of households in rural areas by using multidimensional poverty indicators as follows: a) Housing condition b) Possession of durables goods c) Equivalent income
	Lazim Abdullah (2010)	Used fuzzy set theory to develop three measurement models of poverty line. All models proposed a different poverty line due to the different characteristics and parameters of the models. Indicator used is the average monthly household income.

Neural network based	Pareek and Prema (2012)	Used Artificial Neural Network (ANN) to classify the household as Below Poverty Line (BPL) or non-BPL by using indicators as follows: a) Land holdings b) Types of house c) Availability of clothing d) Food security e) Sanitation f) Consumable durables g) Literacy status of highest literate h) Status of household labour i) Means of livelihood j) Status of children k) Types of indebtedness l) Reason for migration m) Preference of assistance
Adaptive Neuro-Fuzzy Inference System (ANFIS)	Shekarian and Gholizadeh (2013)	Used Adaptive Neuro-Fuzzy Inference System (ANFIS) to identify the most important factors that contributes to the deprivation among urban households. Dominant indicators used are as follows: a) Food consumption b) Health c) Education d) Housing components ANFIS was then parameterized using these factors in order to predict the welfare measure.

To the best of our knowledge, we propose case-based reasoning(CBR) as a new technique to classify the urban household as needy, poor or non-poor for future work. The CBR was found to have a high potential to solve complex problems during this time because it can store past experiences that can be reuse to solve new problem. In addition, the CBR advantages compared to other techniques is:

- Compared with the expert system, CBR can reduce the cycle of knowledge acquisition because cases will always be added to the base case whenever a new problem is solved [28];
- A case-based system can handle unexpected cases not recorded in the system or missing input values by assessing their similarity to stored cases and reusing relevant cases. The self-updatability of the system enhances handling of unexpected cases [28];
- Due to the new case is added each time a new problem, a CBR system continually improves its reasoning capability and accuracy and thus performance from time to time [29];
- CBR recognises that problems are easier to solve by repeated attempts, accruing learning and at the same time can solve the problem quickly and saves energy and time because it can prevent the problem from the beginning of the process [29];

- CBR can improve the efficiency of the implementation of problem solving methods reuse (reuse of past experience) [30].

5 Conclusion

The study expected to enhance the understanding of poverty measurement in Malaysia which is used two difference methods to determine poverty class by using Poverty Line Income (PLI), applied by conventional institutions and *Had Al-Kifayah* (HAK), applied by Islamic institutions. According to the analysis of household data, the paper have described others several factors that are associated in the process of identifying poverty class. The identification of poverty class and others related deprivation of urban poor would enable the policy makers and researchers to draw more appropriate and effective poverty alleviation programmes that would be able to reduce the incidence of poverty in the country. The combination of monetary and non-monetary based measures would be able to improve on the measurement and understanding of poverty in Malaysia, making the distributions on welfare to the poor more accurate [9]. Based on the findings in this study, there are many others factors which have contributed in determining poverty class. These factors have led to uncertainty in determining the poverty class using two methods. Thus, this study will standardize the factors or indicators involved in the determination of poverty by using Java programming in COLIBRI for case-based reasoning. Every case of urban poor will be used as a case representation for future work.

ACKNOWLEDGEMENTS
This research was supported by Ministry of Higher Education under Vot No. 06528 and Universiti Teknologi Malaysia. We are thankful to Majlis Agama Islam Wilayah Persekutuan Kuala Lumpur (MAIWP) and Pusat Zakat Universiti Teknologi Malaysia, Skudai, Johor who provided expertise that greatly assisted the research.

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