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URBAN FOOD INSECURITY AND ITS SOCIO-ECONOMIC DETERMINANTS AND EFFECT ON SUBJECTIVE HAPPINESS: CASE STUDY IN INDONESIA

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URBAN FOOD INSECURITY AND ITS SOCIO-ECONOMIC DETERMINATS AND EFFECT ON SUBJECTIVE HAPPINESS: CASE STUDY IN INDONESIA

ABSTRACT

Driven by economic and population growth, resulting in the growing number of urban low-income households. Most urban low-income household's expenditure is mostly spent on food, and they highly rely on market purchase. This situation makes them more vulnerable to food insecurity than their rural counterparts. However, this issue remains unrecognized by policymakers in many countries, including Indonesia. The government of Indonesia's recent initiatives in battling and monitoring food insecurity is the food security vulnerable atlas. The atlas only focuses on rural areas issues, and the urban areas are excluded. This rural-centric focus slows the development of measurement and initiatives to tackle urban food insecurity. In addition, reducing food insecurity is the main focus of the development agenda; however, a little concern has been paid to how low-income households experience being well. Therefore, investigating urban food insecurity is needed because the policy action and intervention to achieve urban food security may differ from those addressing rural food security. Against the above backdrop, the main goals of this dissertation are divided into three parts. The first is to validate the modification of experience-based food insecurity scales. The second is to examine the socio-economic determinant of urban food insecurity. And, last is to analyze the effect of food insecurity on people's subjective happiness with the consideration of the migration

status of the household. The modified construct of the experience-based scale was able to identify households at higher risk of food insecurity and the prevalence of food-insecure households in the study area. This modified scale is comparable with the established construct from a developed and developing country. Therefore, this modified scale can be one option for a supplementary metric to help better targeting for food security-related programs or strategies for urban food insecurity in Indonesia. This study also presents findings that household income, employment, migration status, house ownership, and household dependency ratio are the key socio-economic determinant of the prevalence of urban food insecurity. Lastly, this study's analyses show that experiencing food insecurity will affect the household's subjective happiness in the urban area moderated by the household's migration status. The contributions of this study are claimed to be threefold. First, the proposed construct contributes to the self-report literature for measuring people's well-being. Secondly, suppose the scale can be implemented in the wide-coverage sample and area. In that case, it will be aligned with the SDGs' target that accurate data and information availability are essential to address society's social development concerns. Thirdly, considering the migration aspect in the policy aimed at urban food insecurity is important for urban planning and policy initiatives for achieving a sustainable city.

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CHAPTER 1 Introduction: Urban, Food Insecurity, and Subjective Happiness

1.1 Background and problem statement

Approximately, half of the total 2 billion food-insecure in the world were recorded reside in Asia regions by the Food and Agriculture Organization (FAO) of the United Nations (FAO, IFAD, UNICEF, WFP and WHO, 2019). This implies that most of them did not have adequate access to nutritious and sufficient food. Although food insecurity in the world is often viewed as a rural issue, further insights of these problems in urban areas are needed because of the rapid growth of the urban population (Levin et al., 1999). Subsequently, significant changes in the food security landscape have been stressed and more challenges have been raised especially for the urban food system.

Urbanization, globalization, as well as economic development have prompted huge changes in diet regimes which directly influence general well-being. In urban areas, huge income disparities and food price dynamics have made accessibility to higher qualified-nutritious foods become more expensive. Population groups with lower income and education levels became more vulnerable and had extremely limited opportunities for healthy nutrition. They will not only stimulate inequalities in food needs, but also socio-economic inequality such as health quality and access, as well as economic productivity. Along with that, the influx of people in the urban area also leads to spatial inequalities shown by an increase in slum housing and poor urban dwellers, especially in economic emerging countries.

As the number of migrants increases, so does the number of poor urban dwellers. As a result, providing and securing adequate food, shelter, education, and other social amenities become more challenging. The issues, brought by urban poverty, about achieving adequate and secure food, in this regard, are the accessibility, availability, utilization, and stability of food. In addition to this, the understanding of securing food is more complicated rather than understanding food supply and price.

The complexities of livelihood and how people deal with the perceived daily challenges are more; thus, measurement is now concerned with food access and food consumption behaviour. These indicate the need for practical urban food insecurity measurement to be implemented. Besides, the actual behaviour and experience related to food access are of interest because it will affect people's overall well-being. The integration of food insecurity investigation with subjective happiness studies will also strengthen the understanding of its link to quality of life.

Furthermore, the connection between food security and people`s well-being can be studied in two main parts. The first part can be examined through objective factor such as socio-demographic characteristics, physical status, availability of food, etc. The second part explores the association of food security with the subjective factor—this subjective factor, such as the state of subjective well-being, happiness, mental health, and food consumption behavior.

Concerning personal aspects, happiness can serve as a proxy for well-being. When people decide on their daily food consumption, the state of happiness fills in a crucial part. This is because subjective happiness is an outcome of a situation and the cause of a more positive situation (Raibley, 2012). Some scholars (Antin & Hunt, 2012; Jones, 2017; Lobos et al., 2015; White et al., 2013; Kornher & Sakketa, 2021) noted that the current approaches and literatures of food security and subjective well-

being or subjective happiness studies have not fully explored the multidimensional aspect of food insecurity. Specifically, how food insecurity condition of the household influences their level of subjective happiness. In addition, in subjective happiness literature, the focus is mainly on variable such as income, employment, and social status, and lack of concern on basic human needs such as food. Though some studies (Frongilo et al., 2017; Asfahani et al., 2019; Salahodjaey & Mirziyoyeva, 2021) found that food insecurity is associated with subjective well-being the context is still at the country or global level. However, to set more appropriate and targeted strategies a regional-specific context such as for urban areas is needed further exploration. This critical issue is limited to be discussed and thus constructs the focus of this study.

In this study, we focus on the aspect of food accessibility measurement and subjective happiness. The former refers to the identification of the household's experience to acquiring food, which includes the development of experience-based food insecurity measures and investigation of the factor that affect a household experiencing food insecurity; the latter refers to the analysis of the effect of food insecurity to the people` subjective happiness. The most important aspect of this study is in an urban setting with a new construct of measurement that built upon the local context social programs and policy towards food security.

In general, investigating and resolving urban food security issues would contribute to the prevalent slower economic and human development in the city. The primary considerations why the investigation of food insecurity and its effect on the people` subjective happiness in the urban area is essential: 1) High urban growth in most of developing countries lead to the growth of urban poor and food insecurity. 2) Most of the developing countries' strategies towards food insecurity are

exclusively rural oriented. 3) urban food insecure households are inaccurately identified therefore this leads to the ineffectiveness country` social assistance program for improving food security. 4) Experiencing food insecurity is not solely affect people's nutritional or health status but also to their overall well-being, certainly providing better access to food will not appropriately increase people's well-being and the need for different approaches of perspectives such as psychosocial to frame food securities strategies is of interest and have not yet been fully considered by the many scholars.

Additionally, there are some specific situations which make Indonesia a study case area for investigating urban food insecurity: 1) Indonesia experiences a huge rate of population growth and uneven population' distribution, and in 2035 it is projected to reach 300 million people (BPS, 2013). Among those, more than 60% will reside in urban areas. 2) Indonesia's economic development in the past ten years has been satisfactory, however, poverty and inequalities are still major problems as indicated by the increase of the Indonesia Gini coefficient (World Bank, 2019), and in turn, hampering the improvement of food security. 3) Most of the measurement approaches and strategies in battling food insecurity in Indonesia are mainly rural oriented. It is shown that in 2015, the government of Indonesia make food security vulnerable atlas to improve and mapping food insecurity in rural areas. 4) The effectiveness of targeting the recipient of a social assistance program for improving the accessibility of the household to obtain food remains a big challenge for the government of Indonesia. 5). The effectiveness of the food insecurity program has a minor effect because the effect of low accessibility towards food is crucially missing from the food security program (e.g., the impact of well-being). Given the challenges

mentioned above, Indonesia is suitable as the relevant area for investigating food insecurity.

1.2 Research objectives

This study aimed to emphasize the knowledge related to food security and its implications/effects in the urban context. As depicted in figure 1.2.1, this study is expected to support better-targeting food security-related programs as a part of poverty alleviation in the study area. Based on the background, as mentioned earlier and the problem statement, the detailed objectives have been covered below:

1. To construct and validate the experience-based food insecurity scales adjusted with the country's program related to food security
2. To examine the socio-economic variables that can determine the prevalence of urban food insecurity in the study area.
3. To investigate the contribution of food insecurity on people` subjective happiness

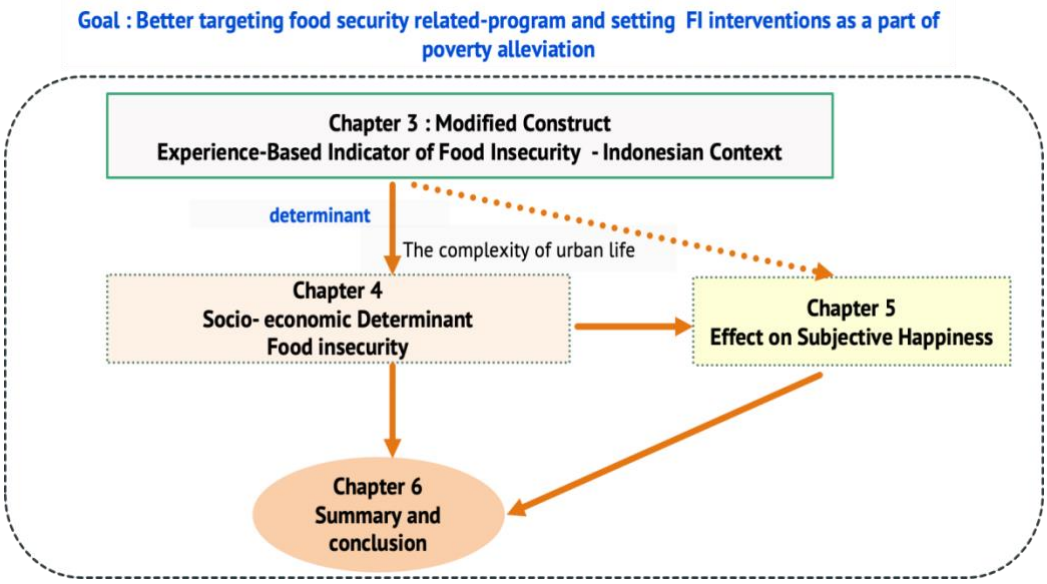

Figure 1.1: The scope of the study

1.3 Dissertation` scope and flow

This research's main focus is urban food security with the case study of Indonesia, as one of a low-middle income country, particularly in three megacities (Jakarta, Bandung, and Surabaya). To achieve the main goals of this study, the dissertation was categorized into six interconnected chapters (Figure 1.3.1).

Chapter 1 comprised the study's introduction, objectives, scope, flow, scholarly contributions, and beneficiaries. Chapter two comprised the literature review about food security, the need for urban food security, subjective happiness, and food choice motives. Chapters three to five addressed the four main objectives of this study. Chapter six outlined the findings, limitations, and areas for further improvement. Chapter detail follow.

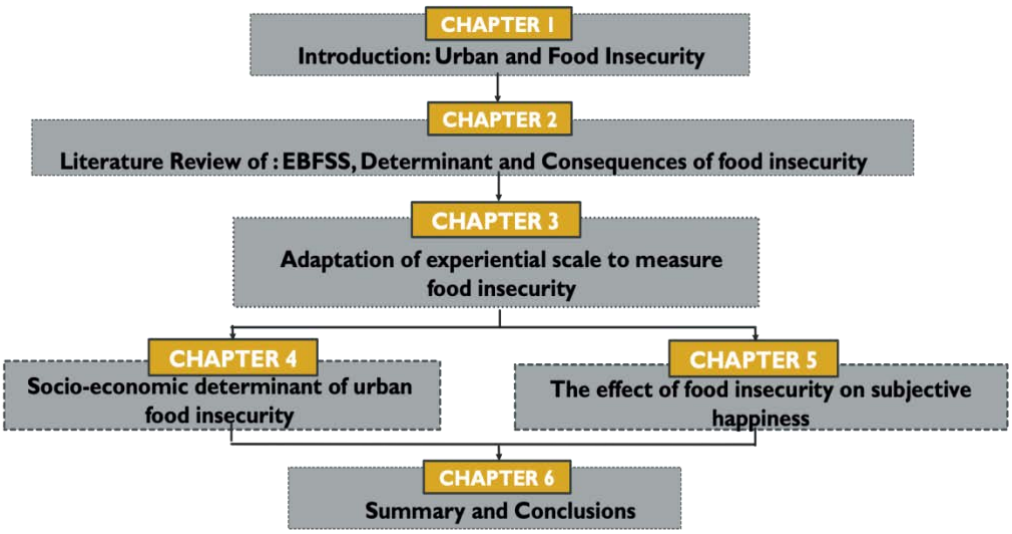

Figure 1.2: Flowchart of chapters

Chapter 2 examines the food security definition, the importance of urban food security, food security measurement, and subjective happiness. The chapter provides the theoretical context for the later chapters, connecting the relevant literature and considering the linkage between food insecurity, and subjective happiness. It also

traces the food insecurity problem and the gap within which the study questions are examined.

Chapter 3 presents an analysis of the development of experienced-based of urban food insecurity. This chapter provides the process of selecting questions items of the food insecurity scales based on Indonesia's food security program. In this chapter, a Rash model is employed to analyze the food insecurity status of the household in Jakarta, Surabaya, and Bandung. The results of this analysis are used as the dependent variable in explaining the driven factor of the prevalence of urban household food insecurity (chapter 4) and the effect on their food consumption decision.

Chapter 4 expand the analysis of urban food insecurity to the exploration of the determinant socio-economic predictor of urban food insecurity. This chapter provides information on the factors which influence the prevalence of urban food insecurity in Jakarta, Surabaya, and Bandung.

Chapter 5 provides the analysis of the effect of experiencing food insecurity by the urban household to their daily well-being that reflected from their state of subjective happiness.

The final chapter of the thesis, **Chapter 6**, summarizes the main findings and scholarly distribution of this study as a whole. The chapter provides a summary of the main findings of chapter 2 to chapter 5. The scholarly contributions are discussed, and recommendations are offered for stakeholders. The area of further research also is outlined in this chapter.

1.4 Significance and Research Position

1.4.1 Scholarly contributions

The above-mentioned problem statements are common to some emerging countries, and the findings of this study hold some significance to the implementation of policy design, policy evaluation programs, and policy monitoring tools. Despite this, some developing countries like Indonesia have not been carried out yet the critical significance evaluation of policy effectiveness. Though the datasets and the findings of the study are specific, the evaluation of the policy effectiveness approach and the results of this study will be generally inclusive and can be applied elsewhere. This study, however, acknowledges that it is not an end in itself, and therefore recommends the further research in the field of food security for the vulnerable people who live in the slum be conducted to identify a broader issue that needs to be addressed to improve their quality of life.

1.4.2 Significance beneficiaries of the study

To contribute more broadly to the food insecurity literature, the study filled a critical gap and had some significance for the policymakers, such as:

1. For city government which concerns about poverty alleviation and food insecurity.
2. For the relative ministries in Indonesia, which are also targeting food security and urban development
3. For scholars and researchers who are analyzing the dimensions of food security, food-related well-being, both the practically and theoretically

CHAPTER 2 Review of food insecurity and its measurement, the determinant and the effect of food insecurity, and Indonesia's food program

2.1 Introduction

The study started with the reason of recognizing the broader concept of food security and current measurement, together with the investigation of the current measurement to evaluate the implication of food insecurity on people's well-being. In the previous chapter, the detailed objectives of this chapter were described. The theory and development of food security definitions were laid out to show the appropriate measurement of each food security dimension. This chapter also reviews the current condition and programs to improve Indonesia's food security, especially for enhancing accessibility factors to obtain food. The research position of the current study was outlined in the literature reviewed in this chapter.

2.2 Methodology

This chapter focuses on the concept and meaning of food security, the significance of urban food insecurity, the type of measurement of food insecurity, and the implication of food insecurity. Some critical studies on food security are then reviewed. The first section of this chapter consists of three subsections, which provide a concise history of food security definition, the importance of urban food insecurity, the type of measurement, approaches of food insecurity, including the objective and subjective measure, and the possible determinant and consequences of food security.

The second section mainly reviewed the consequences of food insecurity on people's food consumption behavior and well-being, including the measurement. The third chapter is about the overview of Indonesia and its food security programs. Finally, a summary from all existing literature concludes the chapter.

2.3 The food security

2.3.1 Concept and definitions of food security

The frame of "Food Security" emerged in the early 1960s as the term related to the need for food for human development (Figure 2.3.1). Then in the 1970s food crisis struck most countries around the world due to unsteady supply and uncontrolled food prices on the world's market. Food security shifted from food development to the assurance of supply and physical access to food (Zue & Wan, 2017). The concept of food insecurity continued evolving in the 1980s and mainly affected by the theory of “food entitlement” popularized as Sen’s theory (Sen. 1981). During this time, the definition of food security assumed that experiencing hunger is not only because of the lack of the food supply but also by low purchasing power of the vulnerable people to meet their food needs. It means that if the accessibility to income increases, people can have better livelihood by purchasing food from the market. In this era, FAO expanded the concept and analysis of food security by including the food access in addition to supply sides of food, as stated below:

"ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 2003).

In the mid-1990s, the focus of food security is to eradicate or at least reduce hunger significantly. During this era, the human right to adequate access to food and nutrition was globally reaffirmed and committed by all countries in the World Food Summit, and each countries government agreed to become proactive in taking steps forward towards food security. In this summit, the reconstructed food security definition arose.

> "Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996).

After the World Food Summit in 1996, the concept and focus of food security proceeded to advance, resulted more than a hundred definitions and indicators of food security by Maxwell (1996), Clay (1997), IFPRI (1999), and FAO (2003).

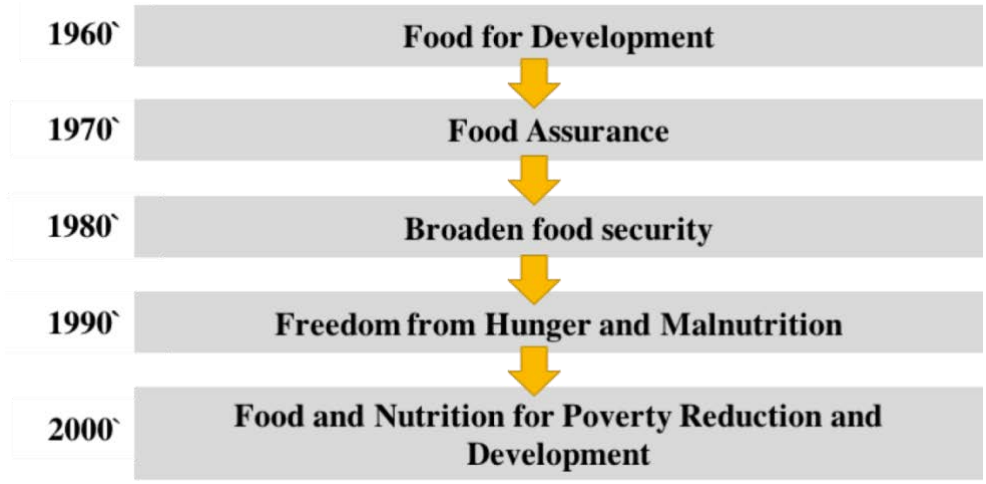

Figure 2.1: The evolution of food and nutrition security (Source: Weingartner, 2000)

The regime of food security is broadened after the summit on food security in 2009. In this international meeting, all world leaders committed to eradicating hunger and alleviating poverty. A new statement in the food security definition was added to the one made at the 1990s World Food Summit. The food security defined in 1996 is mostly used by stakeholders and scholars globally. It should be noted that the limited access to acquired food, has won over the availability, as the root of food insecurity (Sen 1981; Barret, 2010). FAO (2003) stated food insecurity as follow:

> "A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and active and healthy life."

From the definition of food insecurity, several dimensions of food insecurity were distinct:

1. **Food Availability.** In particular, availability alludes to the "physical supply of food from all conceivable sources (e.g., national and international production, trade, food aid, etc.). This dimension is the most fundamental factor in food security.
2. **Food Access.** Access to food by the people is means not only physical access but also socio-economic ability to secure satisfactory amounts of food by combining diverse sources such as house production, farming, borrowing, purchasing, food aid, etc.

3. **Food Utilization.** This dimension means in achieving food security, the ability of an individual to convert the food into adequate nutrition. This ability depends on mainly three elements as follows [Dreeze & Sen, 1989]:
    - Individual socio-demographic heterogeneities
    - Nutrient adequacy of the diet
    - Access to basic health and sanitation services

The examination of food security will investigate the change from food insecurity to security conditions or vice versa, and the likelihood of that change occurring. Moreover, in the 1996 world summit battling in the food insecurity issue is also the main goal. This goal then was taken up as a fundamental goal in the formulation development plan or Sustainable Development Goals (SDGs) in 2015 as the blueprint to achieve a better and sustainable world by 2030. Eradicating poverty, and hunger, and achieving food security were the main target in the SDGs. These development targets can also be achieved if all people, both in rural and urban areas, have adequate access to and assurance of food.

2.3.2 The call for an urban food insecurity study

The United Nations projected that by 2050 urban growth in cities in developing countries will double their populations due to high birth rates and rural-urban migration (Figure 2.3.2). This phenomenon is mostly occurred in Asia and Africa, the regions that will host the world's largest urban dwellers in 2030. This fast-growing population made urban areas facing some changes and challenges: family structure, housing, water, transportation, sanitation, pollution, and challenges relating to the food issue, particularly on consideration of the high market

dependency on food, changing food consumption lifestyle, and rapid urbanization (Piaseu and Mitchell 2004; Banerjee and Duflo 2006; Zhou and Staatz 2016).

As one of the driving factors of the growing population in the urban area, migration has some threats and opportunities for rural and urban dwellers. Since 1990, Indonesia also has been facing rapid urbanization mainly because of rural-urban migration and creating more megacities, especially in Java Island (Firman, 2017). As a result, more cities grow in terms of population and poverty (Nabilla & Pardede, 2014). For the rural dwellers, moving to the city means better livelihood opportunities through better employment, salary, access to service, and the aspiration of success (Waddington & Sabates-Wheeler, 2003; Czaika & Vothknecht, 2014; Nabila & Pardede, 2014). In contrast, if this movement is not supported by a well-targeted policy, then it will cause other urban problems such as increasing the low-income household in the urban area.

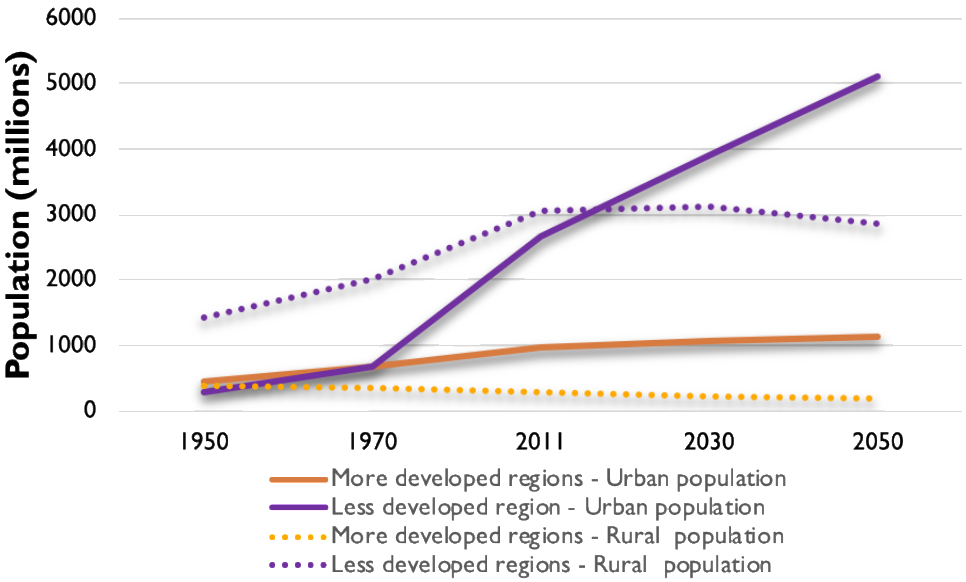

Figure 2.2: Rural and urban population by the development group, 1950-2050

Even though the list of critical issues and challenges in developing countries have mentioned urban food insecurity, it is have not gone unnoticed by

policymakers. It sometimes could jeopardize the effort of the stakeholder. Also, the actions and programs related to the food-related issue in the urban area sometimes focus on the `agri-production` that is mainly planned and legislated on a national scale (Spoor & Robins, 2012). Given the history that food insecurity has been justified in a rural area, most of the measurement and approaches in battling hunger is exclusively rural area oriented. This is also reflected in the program proposed by the committee on food security (CFS-FAO), which emphasises rural economic revitalization through increasing rural agriculture productivity and efficiency (Crush & Frayne, 2010). This rural orientation also occurred in Indonesia, as reflected in their food security and vulnerable atlas, which helps the stakeholder to identify poor households in the rural districts who are vulnerable to food insecurity and how to tackle food insecurity in the rural areas. However, food insecurity issue in low-income urban households is often excluded.

The major assumption why most of the stakeholders are concerned about tackling food insecurity in the rural area is because they assume that increasing the production of agriculture in the rural area will solve the food insecurity in the urban area with the hope that the costs of the food will be decreased, and more people will easily to get the food. However, this assumption is weak and questionable because even though the availability of food in the urban area is sufficient, due to the high dependency on the market purchase of food and limited money, resulting in an accessibility issue. If these conditions continue, in the long-term So, a multi-sectoral intervention is needed beyond rural production.

Even though most of the stakeholders assume that urban citizens are relatively better in terms of economy and livelihood, low-income urban households still tend to have worst health outcomes compare to rural households due to the complex

livelihood, high dependency on-market purchase of food in the urban area, and high vulnerability of uncontrolled prices of daily needs stuffs and services (Mehta, 2000; Studdert et al., 200, Piaseu & Mitchell 2004; Zhou & Staatz 2016). These conditions are likely driving urban people to poverty, increasing inequality, and having negative basic needs insecurity issues, such as food insecurity, as stated by Sen (1981) that large increases in production did not necessarily improve food access and purchasing power of the vulnerable group. This concept is known as `food entitlement`. Other than growing and producing food, `food entitlement` can be achieved through buying, working in exchange for food, and being given food by others (Sen, 1981). If policymakers do not respond to urban food insecurity seriously, it will lead to developmental challenges in the broader context.

The selection of the method is essential for the worthwhile measure of urban food insecurity because of urbanisation and food insecurity issues in urban areas (Battersby, 2017; Cohen & Garet, 2010). The methods should suit the purpose and context the researcher or stakeholder wants to explore. The purpose might be for 1) the identification of household's food insecurity status; 2) the identification of who has been affected; 3) the prediction number of people affected; 4) the designation of cause; 5) the formation of decent monitoring and evaluation system of the programs or intervention (Fronggillo, 1999).

The methods that utilize to measure food insecurity should be able to be validated by using some statistical or mathematical formula, time-dependent, reliable, low-cost, can be integrated and combined with other methods and applicable at the local level. These are will eventually be mandatory because if urban food insecurity could not properly identify, the problem could not address effectively and will lead to greater human development issues. Furthermore, the

lack of detailed data on urban food insecurity will hinder the well-targeted and impact of the social-assistance programs or interventions to improve food security in the urban area.

2.3.3 Food security measurement and approaches

Food security could potentially occur due to poor macroeconomic situations, as mentioned in the historical evolution of the emergence food security concept in the past five decades, or due to threats from the global situation or population pressures. Besides, the possibility of having limited food access and consumption also can be caused by risk factors (crisis, conflict, disaster, etc.) or low purchasing power. Consequently, the measurement approach to food security is complex and depends on the scale and dimension the researchers or stakeholders want to analyze (Ballard et al., 2013). The link between the microscale and macroscale is broadly recognized to contribute to food security (Figure 2.3). Food insecurity analysis is mostly evaluated at the microscale (household and individual level) because food consumption occurs at this level.

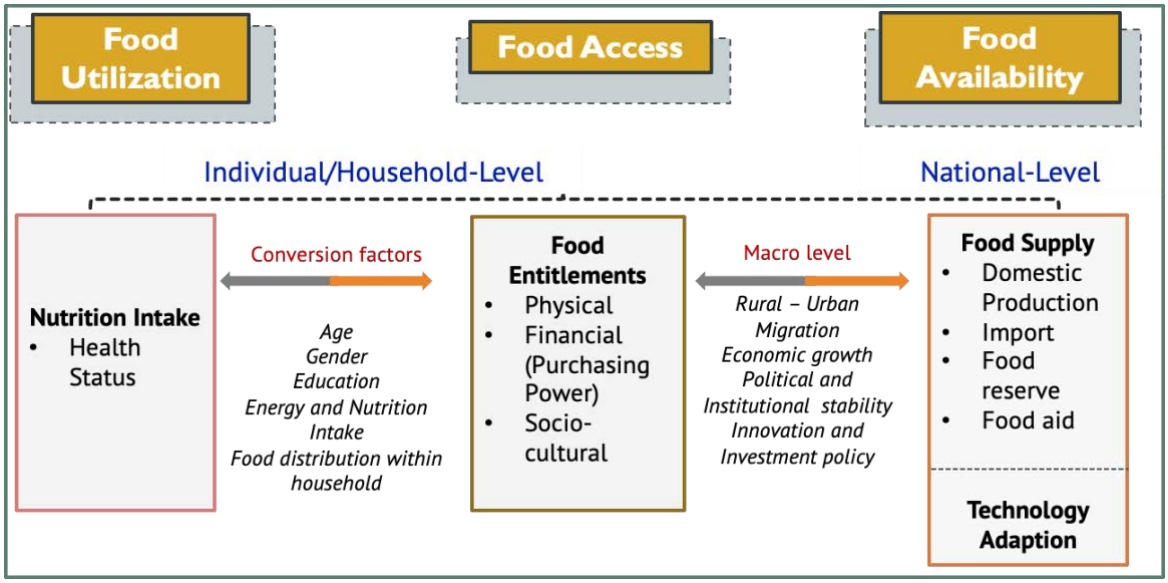

Figure 2.3: The indicator and level of analysis of food security

Since the main cause of food insecurity is mainly because of the food access issue. The suitable unit of analysis to measure food insecurity is from individuals or households. To detect the current state, cause, and implication of food insecurity, it can be measured directly or indirectly. The various approaches are available to measure food insecurity/security, such as anthropometrics (subjective and objective measurement), self-report tools (subjective measurement), proxy tools, and food system-oriented tools. Each approach of measurement has a different dimension of measurement, output, advantages, and disadvantages, as shown in Table 2.1. The disadvantages are mostly caused by the complex situation at the macroscale level, such as global food supply, politics, conflicts, climate conditions, economic situation, and other factors.

Anthropometry is usually used to measure food utilization to understand intrahousehold food distribution as the proxy of health and socio-economic well-being (Jones, 2013). This measurement mainly uses the weight data, body mass index, and height, that reflect the individual's nutritional status. The disadvantage of this measurement is the complex connection between the nutritional outcome and food

security because food utilization cannot be guaranteed cause of the bad nutritional status of an individual. In addition, this assessment is timely consumed and expensive.

The share of food consumed other than from home of added-up utilization is an indicator that provides a glimpse into individual and household dietary quality at the micro-level. It can highlight the trend of food consumption among individuals. This measurement can be effectively used in an urban context because most of urban dwellers purchase and consumed food outside the home (Bezerra et al., 2013; Smith &Subandoro, 2007). The data used for this indicator are 24-hour dietary recall survey and food frequency questionnaires (FFQ), which taking account of the type and amount of each food consumed both inside and outside the home. Since the data used in this indicator is individual data, the differences in eating patterns by sub-population groups based on socio-demographic characteristics of interest could be assessed. However, this measurement's weakness point is that making accurate energy estimation of food that an individual consumes is difficult and requires strict assumptions that could be the source of bias.

The next type of measurement uses the data generated as a proxy tool to identify the level of an individual or household food security level. The most common measurements of the proxy tool are household expenditure survey (HES), dietary intake assessment, and coping strategy index. HES is a typical survey measuring household food expenditure. The determination of food security levels at the household scale is depended on the collected data on food purchasing and food consumed from the people production (Smith and Subandoro, 2007). The recall period is utilized in this survey to collect data on the food acquired by the household. There are some limitations regarding the assumptions applied in converting available food is equal to actual caloric intake (Jones et al., 2013), and the lack of reliability to

measure intra-household food consumption. Another indicator of food security used is the dietary intake assessment. This measurement has some advantages, such as being able to measure food consumption directly, addressing nutrient adequacy, being implemented at the local to the national level, and being cost-effective (Headey & Ecker, 2012). The disadvantage of this measurement tool are: i) the difficulty of surveying the portion size, ii) the consideration of the food consumed outside the house, and iii) the recall period bias, iv) its time-consuming (FAO, 2018). Next, the measurement that falls into the proxy tool's categorization is the coping strategy index (CSI). This tool is relatively new and measures people's behaviour when they are experiencing limited access to acquired food. The adapting strategy index measures the dietary change, the amount of food available, the reduction of number the household member to be fed, and approaches to managing the shortfall (Maxwell et al., 2008; Leroy et al. 2015). The coping strategy questions are summed up and resulting in a single score. The more households experiencing food insecurity is then indicated by the higher score. The coping strategies indices have a significant weakness because this tool is very situation-dependent and could not be standardized.

The last type of measurement is by measuring the prevalence of food insecurity stand on people's experiences capturing the anxiety towards acquiring food, physical experiences, and consequences subjective or experience-based indicator, called subjective or experience-based indicator. This method emerged in the 1990s through qualitative research by some scholars from Cornell University, by looking at the low-income household perception and experiences of a limited resource that can cause food insecurity (Radimer et al. 1990). The research found that the managed process of the food-insecure household is categorized into four sequences: the feeling of anxiety and deprivation related to decreasing choices and limited access to acquire

food, reduce the quality and quantity of food, and their response to the lack of food access situation based on socio-cultural practices (Hendriks, 2015; National Research Council, 2006). The commonly used experience-based scales are US-HFSSM, ELCSA, HFIAS, and FIES. These scales offer a few focal points: i) it is a principal method that is built based on the ethnographic study and measures food insecurity indirectly, ii) captures both psychosocial and physical dimensions of food insecurity, iii) the result from the scales can be utilized to identify the cause and aftermath of food insecurity with the household as the unit of analysis, iv) cost-effective, v) the questions are straightforward and easy to be understood, vi) this method is based on an ethnographic study, so it can be adapted to a local context and has been successfully implemented in many countries and resulting invalid and predictable results. Despite many strong points of this method, several drawbacks need to be considered: i) timeframe of reference could be the source of bias, ii) the questions do not capture food safety dimension, iii) the challenges to standardize the cut-off point.

Table 2.1 Summary of food security measurement at the microscale level(source: Ballard et al., 2013; Bezzera et al., 2013 Coates, 2013; FAO, 2008; Leroy et al., 2015; Moltedo 2014)

Method	**The dimension of food security**	**Types of indicator (subjective or objective)**	**Input and output of the method**	**Advantages**	**Disadvantages**
Anthropometry	Utilization	Both	**Input:** People` weight, height, body mass index, and information about food consumption **Output:** health status or nutritional status	Can be done at national & local level Precise measurement of each individual Inexpensive	Time-consume There is a possibility that the output is not solely caused by food security
Share of food consumed away from home of total food consumption (24-hour dietary call, Food Frequency Questionnaire)	Utilization	Both	**Input:** type and amount of each food consumed at home and outside the home **Output:** energy intake	Can be used to assess differences in eating patterns by sub-population groups or other socio-demographic characteristics of interest Suitable for urban areas	Difficult to estimates accurate energy intake of an individual The assumption of energy conversion can be the source of bias
Household expenditure survey – a proxy tool	Utilization	Both	**Input:** Food andbasic needs expenditure **Output:** Caloric intake per-capita	The dietary quality data Identifies insecure households	Does not account of food consumption outside the house High a risk of the measurement error due to

					the assumption of the conversion factor for caloric intake Expensive and logistically difficult
Dietary Intake Assessment	Utilization	Subjective	**Input:** The record of food consumption by an individual / household The time duration is 24 h/a week **Output:** The sum of food consumed	Measure utilization Possible to understand intrahousehold food security level Deals with both dietary quality and quantity	High cost especially if use this in the national survey Needs the expertise to interview the respondent the set of the questions does not address the quantities aspect Difficult to assess portion sizes
Coping strategy index – the proxy tool	Access	Subjective	**Input:** The questions are focused on revealing managing process of the households if they have food access issue **Output:** How households adapting the situation of food scarcity	The set of questions are easy to understand Identify the vulnerability, straightforwardly identify short-term food insufficiency. Easy to implement	Poor household tend to report small quantities that lead to the misleading between the rich and the poor Difficult to compare across households Short-term and long-term vulnerability indicator cannot be distinguished
Experience Based of food insecurity (US-HFSSM, HFIAS, FIES, ElSA)	Access	Subjective	**Input:** the scale consists of set of items representing the severity of experiencing food insecurity	Simple questions that can easily understand by the respondent Items include the physiological and	Does not capture food safety aspect Recall period can lead to misinterpretation of the data

			Output: Food security/insecurity status based on the cut-off point	physical experience towards food insecurity Easy to be implement, relatively less costly Easy to be implemented across the nations, can be utilize for better understanding of cause and effect of food insecurity One of the SDG indicator	Strongly depended on respondent` memory – can drive to the data error Difficult to standardize cut-off point

2.3.4 Experience-based food insecurity (EBFSS)

Recently, most of researchers have shifted their focus from measuring food from the availability dimension and more focus on the accessibility dimension, which is related to food allocation (Smith, 2017). The measurement of access dimension gained more attention after being introduced by Radimer and colleagues in the early 1990s. Experience-based food insecurity (EBFSS) enhanced from the ethnographic study of low-income housewives in the US. Radimer et al. {1992] used terminology of managed process in obtaining food as the indication of food insecurity experience from the respondent perception` and experiences. The severity of the food insecurity situation is considered a "latent" attribute means that we can imply from the observable "managed process" in the household. According to (Radimer et al. 1992), there were four major stages of the management process of food insecurity. Firstly, reducing the food amount; secondly, reducing the food diversity; thirdly, experiencing anxiety about how to secure food in the future; lastly, social-cultural influence in response to the situation (Ballard et al. 2013; Hendriks, 2015). Among those stages, when respondents become more worried of not having an adequate amount of food to eat in the future indicates the signal of anxiety of experiencing food insecurity. As the situation getting worsened, respondents compromised on the quantity and quality of their diet.

Among the methods that are frequently employed for assessing food insecurity at the micro-level (Table 2.3) EBFSSs is the only measures closely relate to the concept of food security that is defined at the 1990s World Food Summit. As previously described, this method allows people to convey their experiences toward food insecurity in their daily life. As food insecurity is identified through experience lived of the people, this provides researchers better understanding the changes in

these experiences due to the limited access to resources. In addition, some researchers (Cafiero et al. 2014; Jalal et al., 2015; Nettle et al., 2019; Niemeier and Fitzpatrick, 2018; Wu et al., 2019) demonstrated that EBFSS also could be complemented with other food security measurements or cross-disciplinary studies, to upgrade the understanding of the cause and effects of food insecurity, for specifically targeted people.

Moreover, among other food security measurements outlined in 2.1, EBFSS is one of the innovative tools that has already implemented in many countries because of its characteristics: i) easy to use and sensitive to seasonality changes, ii) simple to be measure and manage, iii) user friendly, and iv) cost-effective (Ballard et al. 2013; Pérez-Escamilla 2012). Additionally, the strong point of EBFSS is the ability to detect the access dimension of food insecurity, which can help to examine the cause and impact of food insecurity. Since EBFSSs adhering to the physiological manifestation signifying the insufficient quality and quantity of food can allow researchers and stakeholders to measure, prevent, monitor, and respond proactively towards this issue and contribute to improving food security governance (Ballard et al., 2013; Pérez-Escamilla, 2012). The items of questions constructing EBFSSs is relatively short, so the scale also can be implemented both in the rural and urban area both in developed and developing countries (Knuerppel et al., 2010; Mohammadi et al., 2012). Though this measurement originally developed from the developed country setting, many developing countries applied and remodified this measurement adjusted with the country situation (Nord, 2002). For example, in 2002 Bangladesh developed the scale through the ethnographic study, focus group discussion, and cognitive testing method to refine the items in the scale.

Despite the above-mentioned qualities, the recall period utilised in the EBFSS could be the source of bias. In addition, setting the appropriate cut-off point for household food security categorization is highly dependent on the subjectivity of the researcher. However, the inter-country comparison could be conducted to show the sensitivity of the cut-off point. Since the emergence of the EBFSS in the 1990s, various cultural characteristics have successfully adapted, developed, and employed this measurement at the national and regional levels (Table 2.3).

In improving food security, if measurements are to be used for intervention programs, better targeting of social assistance programs, impact evaluation, and monitoring food security it requires a deep understanding of food-insecure households in the broader context (Frongillo, 2013) because the effects of food insecurity are not solely related to food but also non-food context such as physical and psychosocial well-being (Jalal, Frongillo, & Warren, 2022). This relationship is depicted (Figure 2.4).

Table 2.2 the development and utilization of EBFSS across countries in the past 30 years (sources: FAO, 2012)

EBFSS	**Year**	**No of items in the scale**	**Recall period**	**Country**	**Application and Impact**
US-HFSSM	1995	18 questions	12 months	United States	The food insecure household were identified and received the food insecurity-related program
Bangladesh scale	2002	14 questions	12 months	Bangladesh	The scale has been applied to vulnerable households in Bangladesh
Brazilian Household Food Insecurity scales (EBIA)	2004	14 questions	3 months	Brazil	The prevalence of Hunger was decreased between 2004 and 2009
Household Food Insecurity Access Scales (HFIAS)	2007	9 items	30 days	Developing countries	Being implemented as monitoring and evaluation tool in USAID's Food and Nutrition Technical Assistance (FANTA) project
Latin American and Caribbean Food Security Scale (ELCSA)	2007	15 items	3 months	Latin America and the Caribbean	The measurement has been successfully applied in national surveys and public opinion polls in some Latin America countries such as Mexico, Peru, Guatemala, etc.
FIES	Gallup World Poll 2014	8 items	12 months and 1 month	Global Implementation	Provide a comparable food insecurity and hunger prevalence rate in the world.

This calls for the investigation of the effect of experiencing food insecurity to the people' quality of life and their food consumption behavior. This understanding is needed to capture more obvious picture from the complexity of the causes and effect of food insecurity. A comprehensive urban food insecurity measures and implication identifies household food insecurity and provides further suggestions for the policymakers to determine solutions and programming of the wider context (Battersb, 2017; Fukuda-Parrand Orr, 2014).

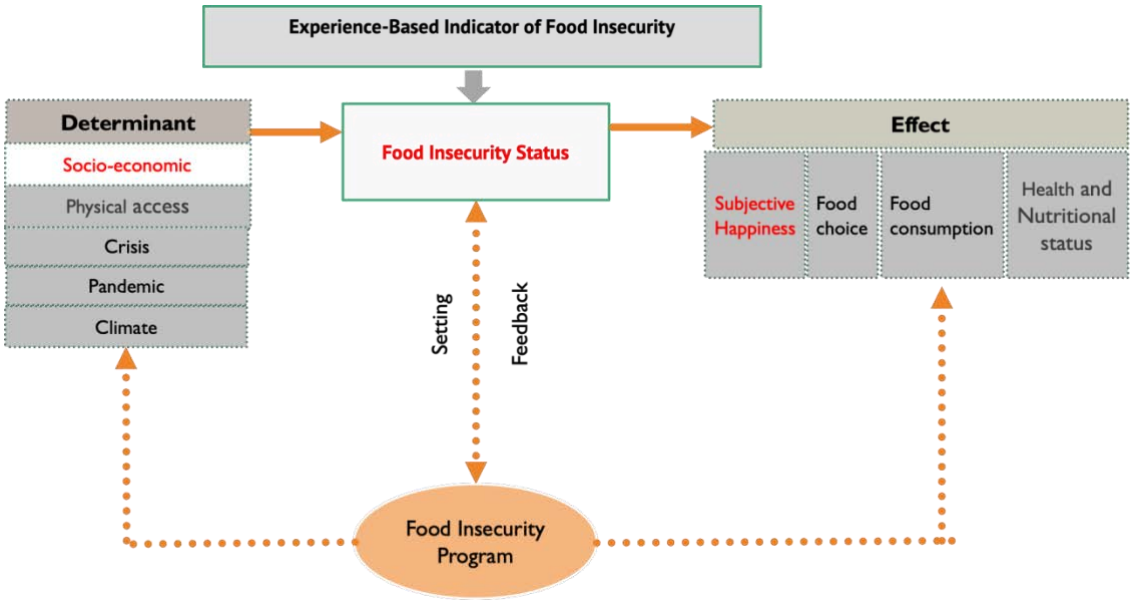

Figure 2.4: The determinant and effect of food insecurity

2.4 Subjective Well-Being

2.4.1 Concept and key factors

The research of social well-being has become of heated discussion among scholars and beyond in the past 20 years. The concept of well-being is linked not only to traditional economic indicators but also to an individual evaluation of their well-being related to his/her personal goals and standards (Antonides & Van Raaij,

1998; Diener et al., 2002; McGregor, 2008). The approach to well-being is divided into two approaches.: objective and subjective (Gartaula et al., 2012). The objective approach refers to living conditions and quality of life such as income, health, education, job, housing, employment, etc. The higher income increases the ability of the people to satisfy their needs. This approach generally focused on analysing the aggregated or secondary data. The subjective approach is concerned with the evaluation of individual positive and negative emotions and typically uses social surveys or self-report methods to collect primary data. The subjective approach to well-being has gained significant attention due to its ability to substitute and complement the objective approach. The subjective well-being measurement assumes that people's well-being can be determined by their experiences of life in terms of happiness. According to (Raibley, 2012) happiness can perform as a proxy of well-being because examining individuals` subjective experiences of their lives in the context of his/her standard is essential for understanding the quality of life.

Many scholars have investigated the link between subjective well-being or subjective happiness and decision-making and its performance in daily life. For instance, a study conducted by Diener & Seligman (2002) found that more positive events and emotions tend to be expressed by happy people when making daily decisions. Therefore, subjective happiness is not only an outcome of a situation but also the cause of a more positive situation.

Studies on subjective well-being or subjective happiness carry the transdisciplinary approach that connects the key factors that relate the psychological state, physical environment, and socio-economic characteristics of the people. Most of the happiness studies have mainly focused on circumstances (e.g., income, education, health status) that influence people's subjective happiness (Cracolici et al.,

2012; Diener et al., 2013; Sun et al., 2016; Vera-Villarroel et al., 2012). Even though the above-mentioned studies demonstrated that the state of happiness of a person has correlation with social accomplishment in daily life which can be captured by the broader socio-economic point of view, but has not been paid attention yet to the link between subjective happiness and more concrete experience in daily life such as experience that related to daily food consumption (Estes & Sirgy, 2019; Gartaula et al., 2017; Jhonson & Markowitz, 2018; Schnettler et al., 2015; Steptoe et al., 2015). Food consumption activity is one of the fundamental dimensions of quality of life that could describe an individual's living conditions. According to food-related studies, the aspects of economic and material living conditions are related to food availability, access, and preparation ability (Jhonson & Markowitz, 2018; Jones, 2017; Smith et al., 2017; Quandt et al., 2001).

2.4.2 Measurement of happiness

Happiness is defined as one's retrospective judgement in terms of cognitive and affective exposition. By considering the conceptual approach that a researcher employs, different ways can possibly measure happiness. There are three basic approaches to evaluating happiness. First, the affective approach is considered as the global evaluation of an individual's quality of life. The second is the cognitive approach, which is based on a global evaluation of life satisfaction. And, the last is subjective happiness, which brings the overall positive and negative experiences in an individual`s life at a given time using self-reports (Diener, 1994; Lyubomirky & Lepper, 1999). As noted by Kanehman and Kruger [2001], affective and cognitive approaches are having some issues in measuring the actual happiness experienced by an

individual. While the subjective happiness approach could measure to the extent to which an individual feel as a happy or unhappy person.

From a positive psychology point of view, investigating the determinant factor of subjective well-being to make effective policies to enhance the level of happiness is one of the main targets (Seligman & Csikzentmigalyi, 2000). The scientific community defined happiness as a combination of positive and negative situations and life satisfaction (Chen, 2010; Deiener et al., 1999; Lyubomirsky and Lepper, 1999). Therefore, frequent positive situations, infrequent negative situations, and life satisfaction are considered as indicators of happiness (Busseri & Sadave, 2011). Those three indicators are required evaluative judgments based on individual life experiences. In this regard, self-reporting measurement is one of the common tools in determining how happy the individual is. According to Lyubomirsky (2001), a person might appraise she/he as a happy person, despite having experienced a frequent negative or unpleasant situation in the past month, including how a person perceives, interpret and recall their live events. Therefore, the subjective happiness approach is relevant for low-income households in that they may consider happy despite having relative uneasiness and obstacle relatively.

The growing interest in happiness and well-being study has encouraged the increase of several types of self-reporting measurement in the past four decades. In the 1960s, Bradburn developed a multidimensional construct for measuring the quality of life. This measurement is known as Affect Balance Scale, which consists of 10-items rating positive and negative affects experience during the past four weeks (Galtzer & Gulyas, 2014). This Bradburn` scale is built upon the assumptions concerning the affective component of subjective well-being. The Satisfaction With Life Scale (SWLS) developed by Diener and colleagues in the 1980's is being another

commonly-used measure of subjective well-being. This 7-items scale aims to measure the life satisfaction component of well-being. Thus, SWLS is a measure of the cognitive component of subjective well-being. The subjective Happiness Scale (SHS) is stemmed from the subjectivist approach and measures total "happiness. This scale was developed to fill the literature gap regarding the need for a measure that directly focused on the state of happiness. The SHS is a 4-item scale to measure overall subjective happiness for use with different ages, jobs, languages, and cultural groups. This global measurement gives a broader classification of well-being and connects to more global psychological phenomena. Additionally, Lyubomirsky and Lepper (1999) posited that most of people are possible and capable of reporting their state of happiness, and this subjective evaluation is not equivalent to their satisfaction with life.

The discussion of subjectivity in subjective happiness especially in the subjective happiness scale is always a demanding exercise for many scholars. The clarification of subjectivity and objectivity depends on the context or point of view we want to see, such as from the concept, the concept components, or the measurement method. For instance, from the point of view of the component of the concepts, we can refer to the unit we are going to measure. In this study, the overall happiness information is obtained from the subjects' perspectives and only perceived by themselves. In addition, the indicator to measure happiness represented in the scale was not determined or shared by external observers. So, the nature of the data in this study is subjective. And in terms of measurements, as mentioned earlier, the subjective happiness scale assesses overall happiness.

Among the psychometric measurement of happiness, SHS has some advantages such as its unitary factor supported the implementation cross-country with unique languages such as German, Tagalog, Japanese, Malay, Portuguese, and Turkey (Swami et al., 2009; Otake, 2015; Shima et al., 2004; Swami, 2008; Spagnoli et al. 2010; Satici et al., 2016, Chien et al., 2020). In addition, many studies (e.g., Diener, 1999; Swami, 2008) show that this scale is holding high internal consistency and reliability over time, good construct, and discriminant validity, correlates with theoretically relevant construct. Due to its qualities, the SHS has grown rapidly, gained popularity, and become one of the most frequent self-report measures of global happiness.

One of the most commonly self-report tools used by many scholars to measure happiness status is the subjective happiness scale (SHS). The 4-items of the original version were developed by Lyubomirsky and Lepper (1999) and used to measure people's subjective happiness in different cultural backgrounds, socio-economic characteristics, and languages. Two items of the SHS require the people to identify their state of happiness by using the absolute and relative evaluation scale to peers. In contrast, the remaining things permit individuals to present how to describe happy and unhappy person's characteristics (Lyubomirsky and Lepper, 1999; Lyubomirsky, 2001).

Research in happiness studies has empirically identified many benefits of enhanced happiness of people and many researchers have begun to explore the factors and interventions to increase the happiness of people. However, the studies that correlate subjective happiness and food consumption is still limited. Holder (2019) and Diener & Seligman (2002) mentioned that the subjective happiness of the people could be the outcome and the cause of a more positive situation. For instance,

the cause of healthy food consumption is not limited to food related factor but extends to the social, psychological state, and life experience related factor.

2.4.3 Subjective Happiness and Food Insecurity

In the sustainable development goals (SDGs), subjective well-being or subjective became one of the indicators. The lower subjective well-being or happiness will lead to an unhealthy society, especially in the urban area. De Neve and Sachs (2020) state that all SDGs indicators are intended to improve people's subjective well-being globally and regionally. Some researchers, such as Sorensen (201)], Clark et al. (2019), and Morisson [2020] argue that though an urban dweller might have a higher level of happiness compared to rural residents due to a higher economic opportunity, but the massive changing in technology, inequality, and lower level of social capital in the urban area will cause the declined of their happiness. In contrast, Lenzi and Peruca (2020) stated that the positive impact of urbanization (i.e. employment, education, etc) increases the subjective well-being of the people in medium cities. However, in highly urbanized city and megacity, those positive impact is outweighed by the negative impact such as spending behaviour, cost of living, crime, poverty, etc. that are potentially experienced by urban dwellers. This phenomenon is known as “the urban paradox”.

In the field of subjective well-being or subjective happiness in the urban area, little attention has been paid to the issue of food security (SDG 2). The shortcoming of the existing investigation of subjective happiness is because of the overestimation of the influence of other variables (e.g., income, employment, etc.) and ignoring the basic human need such as food. This lack of investigation is possibly due to the

challenge in data availability and measurement since most of them are available at the country or regional level. For instance, the happiness data in Indonesia is only available in the form of province's happiness index and a complete data set is quite limited.

Food insecurity is related to many aspects such as poor mental health outcomes, psychological distress, and anxiety (Laraia et al., 2006; Temple, 2008; Carter et al., 2011; Jones, A.D, 2017; Rahman, Hasnain, & Islam, 2021; Sundermeir et.al., 2021). The lack of adequate healthy food and nutrition will lead to malnutrition, obesity, lower growth, and physical performance (Olson, 2005; Klesges et al., 2001). Moreover, experiencing food insecurity could affect people's subjective well-being (Frongilo et al., 2017). There have been several past researches discuss the relationship of food insecurity with various measurements of subjective well-being such as life evaluation score and affect balance (Asfahani et al., 2019); life satisfaction (Salahodjaey & Mirziyoyeva, 2021); evaluative, affective, and sensory experiences assessment (Rojas & Guardiola, 2017); best negative experience index and Cantril ladder of life (Kornher & Sakketa, 2021). The focus of those studies is that they were looking at the country-level perspective by investigating the effect or impact of food insecurity on subjective well-being at the macro-level (Diener and Tay, 2015; Guardiola & Rojas 2015; Frongillo et al. 2017; Sulemana & James, 2019; Kornher & Sakketa, 2021). Moreover, only a few studies at the micro-level exist (Bertoni, 2015; Bezuneh & Yiheyis, 2019). The investigation at the micro-level could provide more precise analyses and avoid the bias that usually happens in the process of data aggregation.

Based on the above backdrop, I hypothesize that considering food insecurity with other socioeconomic variables in the investigation of the link between food

insecurity and subjective happiness will explain the position or importance of food insecurity. This study is also crucial for policy development for social welfare, especially for urban families in developing countries. Suppose the impact on low-income urban households' subjective well-being /happiness is mainly explained other than food insecurity, such as housing, then the strategies or policy initiatives around creating a proper and subsidized settlement, rather than focusing on the policy or strategy of the effect of food insecurity on subjective happiness.

2.5 Food security program in Indonesia

In Indonesia, rice is the form of primary food for most citizens, and hence it is important to focus on rice in terms of an experience-based food insecurity concern for low-income households. Most of the low-income households, particularly, spend a quarter of their income on rice (Timmer 2004). Early in 1998, the Indonesian Government introduced OPK (special market operations for rice), in response to food insecurity issues (Sumarto and Bazzi 2011; Kwon and Kim 2015), during a period of economic and political crisis. Studdert et al., (2001) report that food prices increased by over 70% in Java Island as a result of the crisis in 1998. Four years after the crisis the OPK program was replaced with Raskin (rice for the poor), which provided in-kind transfers at a subsidized price so that ineligible households could be excluded from benefit lists.

The Raskin program, the oldest social protection scheme in Indonesia, is growing as the largest social assistance initiative in terms of coverage and as the second-largest social assistance in terms of expenditures (World Bank 2012). However, this scheme faced several transfer values issues such as inaccuracy of targeting and missing rice in the last-mile distribution, all of which reduced the values

and benefits to the target households (Hastuti et al. 2008; World Bank 2017). The targeting of the eligible household to receive this was program was made by the community that distributed equally within the community. This fact was shown in the National Socio-Economic Survey of Indonesia (SUSENAS) database that nearly 40% of the non-poor also receive Raskin (Figure 2.5) and some recipients also are categorized in the highest expenditure decile.

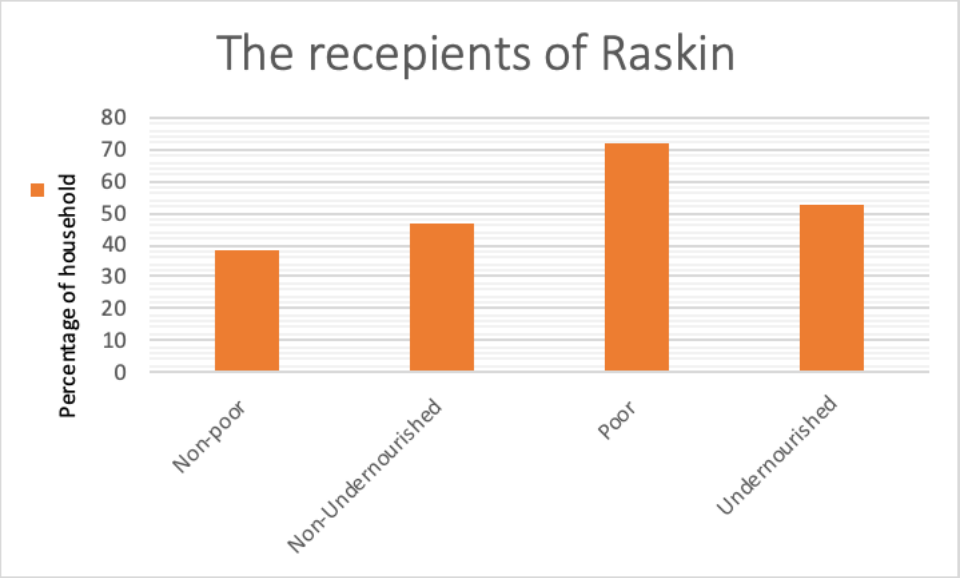

Figure 2.5: Recepient of Raskin (Susenas, 2010)

Besides Raskin, the GOI introduced PKH (Family Hope Program) as Indonesia's first conditional cash transfer program in 2007 (World Bank 2012; Kwon and Kim 2015). Both Raskin and PKH have a similar purpose—improving the accessibility of staples and nutritious food items either by cash transfer or a subsidized scheme. However, PKH has a different mechanism to ensure its target performance is better than Raskin's (Afkar and Matz 2015). Additionally, this program has a positive impact on assisting the beneficiaries (poor and nearly-poor families) to access education and health care for their children, high-nutrition foods for infants, and welfare in the short term, and also reduces the opportunity cost of obtaining those services. It is also important to note that PKH has some weaknesses such as low

coverage and limited coordination among service providers at national and sub-national levels.

To improve its effectiveness, Rastra has undergone some changes in the past few years. However, last-mile distribution issues and targeting accuracy still pose critical challenges due to a lack of accurate data and information, coordination across government agencies, and monitoring of economic conditions in the local region. These issues hamper the ability of the program to achieve its objectives.

In response to the last-mile distribution issues, in 2017, the GOI brought about a huge transformation by introducing the e-voucher initiative of the Rastra program both in rural and urban areas. The target criteria of Rastra recipients have changed several times, depending on the data sources used, budget allocations, and the recipient's economic level (Alderman et al. 2017). Since 2005, the GOI formulated the Food Security and Vulnerability Atlas (FSVA) to respond to the target issue (Ministry of Agriculture and World Food Programme 2015). The second and third editions of FSVAs were launched in 2009 and 2015, respectively. This kind of map mainly focuses on rural populations, and, based on the ratio of per capita consumption to staple food availability, the map aims to determine which are the highly food insecure people under the poverty line, the underweight rate, and the rural districts with inadequate infrastructure [access to electricity and clean drinking water].

The inclusion of urban areas was absent in Indonesia's Food Security and Vulnerability Atlas (FSVA) (Figure 2.6) because the stakeholder assumed that rural areas needed more attention. There are no different parameters between the prevalence of food insecurity in urban and rural. However, given that the livelihood in urban areas is more complicated than in rural areas, we assume that the indicators

or food insecurity parameters are relatively different between urban and rural areas. In 2013, The central Central Bureau of Statistics [BPS] of Indonesia estimated that by 2035 more than 60% of the total population will reside in big cities. Given the above backdrop, the understanding and investigation of urban food insecurity in Indonesia is becoming increasingly urgent as rural-urban migration in Indonesia continues.

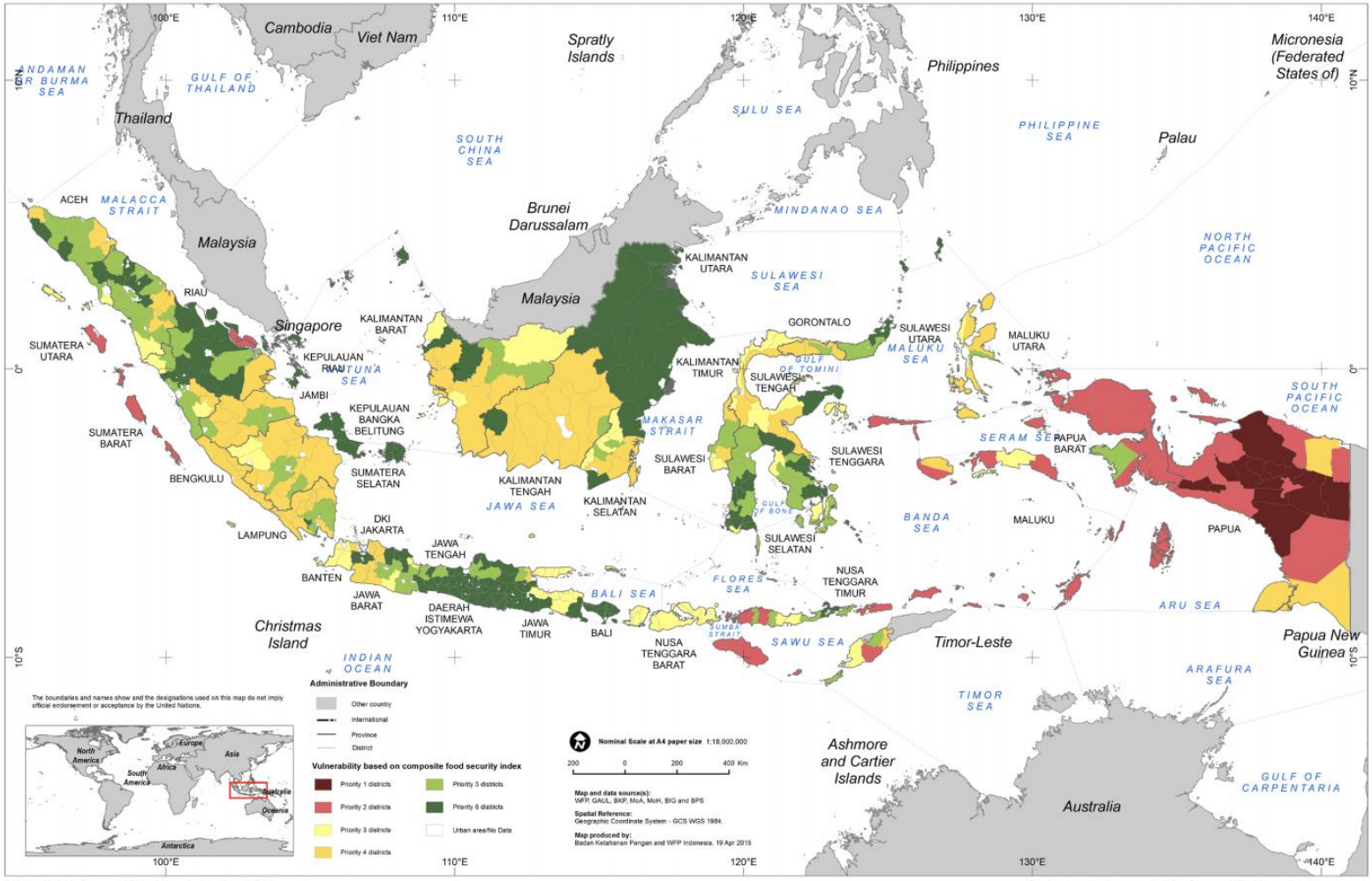

Figure 2.6: Vulnerability to food insecurity 2015 (source: Ministry of Agriculture and World Food Programme, 2015)

2.6 The terminology of low-income urban households

The definitions of low-income households in the context of economic and social conditions vary. Therefore, an individual cannot be classified as a low-income household by only a single universal definition. Consequently, those who lack of purchasing ability for basic needs including food thus experiencing food insecurity, and assisted by public assistance from the government are categorized as low-income household (Alderman 2009; Indrianingrum 2017; Kaufman and Karpati 2007; Reicks et al. 2003). Another definition stated that low-income is who is living with low-quality basic services such as poor sanitation, drinking water, and electricity (Indrianingrum 2017; Miewald, Ibanez-Carrasco, and Turner 2010; Sharma, Dwivedi, and Singh 2016). In shorter form, Acs & Nichols (2006) concluded that low-income households face economic disadvantage and are experiencing material hardship. Those who lack of choice and access to make any decisions related to their daily lives are also defined as low-income households by Asian Development Bank [2016]. The Public Housing Ministry regulation of Indonesia (Permenperin No.5/permen/M/2007) defined is a family with a monthly income of less than 2,500,000 Indonesian Rupiah as a low-income household.

Drawing from the above explanations, this study highlights a low-income household as a household experiencing material hardship, high uncertainty of having a job, less disposable income, and living in an inadequate infrastructure environment (e.g., poor sanitation and environmental facilities).

CHAPTER 3 Adaptation of experience-based food insecurity scale. A case study: Indonesia

3.1 Introduction

The development of food insecurity measurement based on the people's perspective and Indonesia's social assistance program's challenges were outlined in chapter two. Since the main issue of food insecurity is due to lack of access to food, rather than its availability (Sen 1981) (Barret, 2010), many countries, including Indonesia, have implemented several programs and initiatives to increase accessibility to food for low-income households. In Indonesia, the two most significant social assistance programs that directly and indirectly improve the poor's accessibility to obtain food are the Rastra and the conditional cash transfer program. However, these programs face the same problems related to the targeting recipient and losing food in the last mile distribution, coordination across government agencies, and monitoring of the local region's economic conditions. These issues are slowing the progress of both programs. In 2005, the Government of Indonesia formulated the first Food Security and Vulnerability Atlas (FSVA) to solve poor targeting issues. In 2009 and 2015, the second and the third FSVA were launched with some improvements from the first version. This atlas aims to identify the highly food insecure people, the underweight rate, and the rural districts with inadequate access to electricity and drinking water. However, the FSVA mainly focused on rural populations and was made based on the ratio per capita consumption to staple food availability, poverty line, underweight rate, and access to electricity and clean drinking water. In the analysis of this Atlas, urban areas were excluded because they

require different parameters to examine urban food insecurity. Moreover, most food insecurity initiatives are always rural-biased and remain the primary trademark of current food security policies. Considering that more than 65% of Indonesian will reside in urban areas by 2035 (BPS 2013), the investigation of urban food security is becoming urgent as the rural-urban migration in Indonesia continues. Despite this, improving the targeting of food programs in urban areas is also needed. One of the tools for identifying food insecure people is through experience-based measurement, and its application is still limited in Indonesia.

This chapter of the study aimed to evaluate urban food insecurity based on people's perceptions and experiences. The specific objectives of this study are two-fold: (a) to develop an urban food insecurity scale based on people's experience adjusting to Indonesian current food security program, and (b) to identify the household food insecurity status.

3.2 Methodology

In order to achieve the objectives of this chapter, a study case was conducted in three big cities in Indonesia, Jakarta-Bandung-Surabaya as the representative of megacities (Figure 3.1). A paper-based survey was employed in three cities in Indonesia. Figure 3.2 shows the flow of this chapter.

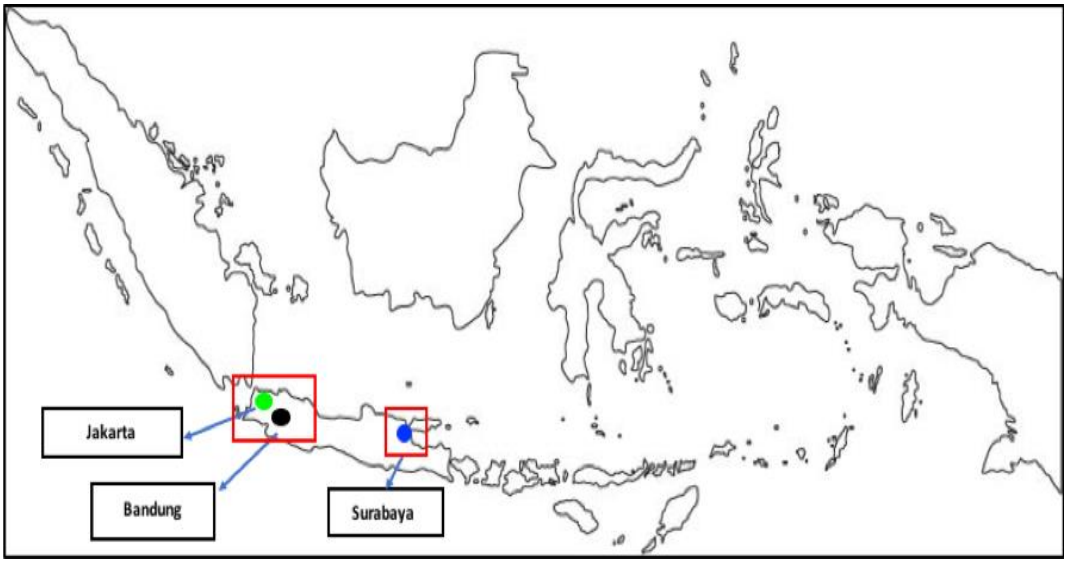

Figure 3.1: Research` location (Based on various sources, under creative commons attribution license, 2017)

A review of experience-based food insecurity assessment and the Indonesian food program was conducted, and the Indonesian experience-based food insecurity assessment was developed. A paper-based questionnaire survey was employed in three cities in Indonesia. The questionnaire comprised two parts: (Part-1) questions about the socioeconomic and daily priorities, and (Part-2) questions about the EBFSS. Specifically, Part-1 asked about socioeconomic indicators for food security (e.g., gender, age, occupation, and income level). Information on the latter is being employed for the investigation in chapter 4. In Part-2 of the questionnaire, each respondent was asked the following ten questions (Table 3.1) with the choice to answer "yes" if affirmative, or "no" if not affirmative. The questions were asked over a 12-month recall period, following the approaches of US HFSSM (National Research Council 2006). A longer recall period provided a bigger chance of observing household food insecurity to avoid the influence of seasonal effects (Ballard et al. 2013).

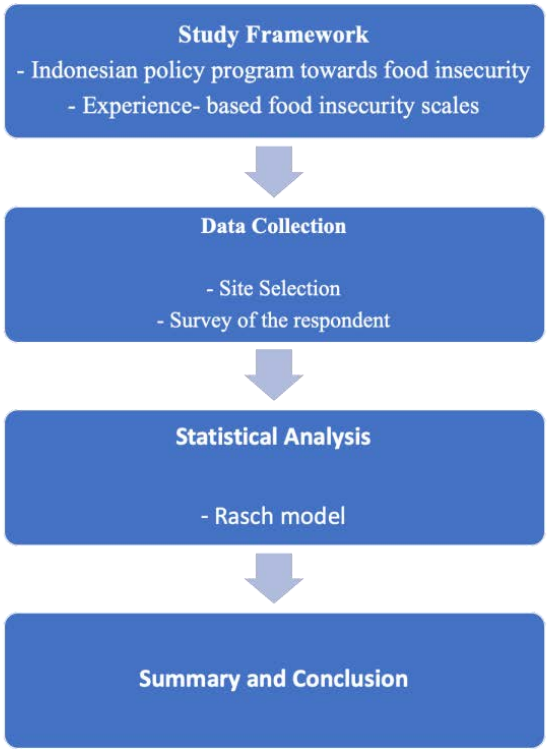

Figure 3.2: The methodology of Chapter 3

The questionnaire was pre-tested in a small pilot sample to assess the adequacy and clarity of the questions. The final questionnaire was developed in English and subsequently translated into Indonesian through a back-translation process. Local institutions helped the process of community and household selection in each city. In this study the targeted sample size in each city was calculated by :

$$n = p\,(1 - p)\left(\frac{z}{E}\right)2. \qquad \text{(Eq.1)}$$

where z is the z value from the standard normal distribution, E represents the margin of error, and p is the proportion of the food insecure household in each city. A five percent margin of error of true proportion was set for determining sample size in this study with a 90% confidence level in each city. Due to the lack of information about the number of food-insecure households in each city, therefore this study used 0.5

for the proportion (p). Based on the calculation the ideal sample size that needs to be obtained in each city is 68 households. During the survey, the study's purpose was fully explained to all potential respondents, after which those who volunteered to participate were asked to sign an informed consent form before completing the questionnaire, and all their identities were kept anonymous. However, due to the subject's availability and some incomplete data, we only have 150 households' data for three cities.

After the data was gathered, a Rasch analysis was applied to assess the food insecurity status of the respondents. The Rasch model is usually used in evaluating the appropriateness of the questionnaire's questions to create the scale. The result of the food insecurity status of the respondent was then employed in chapters 4 and 5.

3.3 Developing experience-based food insecurity scales

Food insecurity is a complex issue that has been investigated by many scholars in the field of development economic and public health. However, the understanding of who, where, and how the survival mechanism by food insecure people remains unclear. Therefore, In the early 1990s, some scholars from Cornell University conducted ethnographic research and revealed the steps that households go through when living with the sensation of hunger. This measurement is categorized as the subjective indicator because it measures food insecurity from the people's perception along with their behavioural changes until they are in the food insecure situation. As outlined in chapter 2, the strong point of the EBFSS in identifying food-insecure households makes these tools implemented in many contexts and scopes, from the global to the individual level.

Instead of building from individual perceptions of food insecurity, the US-HFSMM consists of 18 items divided into two parts. The first ten questions were for adults, and the last eight questions were for children. All the items are based on actual behaviour towards and experience with difficulty meeting food needs (Ballard et al., 2013; Broussard 2019).

In addition, the questions are not focusing on its outcomes such as the nutritional status but the severe food access problem in a wide range. In the EBFSS the respondent's response to all items can be used for the food insecurity status categorization (Jones et al., 2013). The identification of household food insecurity is crucially important in understanding the overtime changes in these experiences.

The Rasch model assumption was employed to verify the data, and then the number of affirmative responses was used to determine the severity of food insecurity. An increase in the severity of the food access problem in a household resulted in an increase in the severity of some actions or experiences of an individual or a household. The severity of those actions or experiences is shown when a household starts to reduce food intake and continues until household members experience hunger.

The severity of food insecurity depended on the total number of “yes” answers to the item’s scales after the data was verified using the Rasch model assumption. An increase in the severity of the food access problem in a household increases the resulting severity of some actions or experiences of an individual or a household. These actions and experiences start when a household starts to reduce food intake and continues until household members experience hunger.

This approach has been widely used and modified in several versions such as ELCSA, HFIAS, and FIES [the latest and compact version of the experience-based food insecurity scale]. In the existing literature mentioned that this kind of self-report

approach is able to capture the important aspects of food accessibility (Maxwell et al. 2003; Steptoe et al. 2015). However, this approach application in Indonesia is limited in the literature (Studdert et al. 2001; Usfar et al. 2007; Mahmudiono et al. 2018). Nonetheless, Indonesia's three megacities' household food security status was not inclusively explored, and further investigation to validate this approach in an urban setting is important.

To assess food insecurity in the three cities, we employed the standard US-HFSSM. To deliver the concept more thoroughly, the developing countries' specific context (item 7 and 8), and Indonesia's specific context (item 2 and item 5) also were included in the questionnaire. These two novel items are specifically taken from Indonesia's social assistance aims (Table 3.1, item 2 and 5).

The motivation for the inclusion of the new items were: 1) the original version of the EBFFS do not assess more specific item of questions that may be associated with food insecurity such as anxiety of managing food with other basic needs to reflect the situation in an urban setting, 2) The adjustment of the items in the country-specific context could help improves the food security governance (Perez-Escamilla et al., 2012). A careful translation to Indonesian language has been done in the questionnaire items to make the respondent understand the questions and to produce reliable data. The modified version of EBFSS was tested by some Indonesian in order to check the clarity of the translation.

Table 3.1 List of assessed items and their concise descriptions

Item no.	Item description	Concise description of the items	Adapted from
1.	Worry about food	Worried	US-HFSSM
2.	Worry about balancing the need for food for your family with other basic needs	Balancing food and basic needs	Author's item based on the Indonesia's Food Aid program's purpose
3.	Limited choices of food	Limited variety	Author's adaptation of HFIAS item on the variety of food
4.	Cut the size of the meal	Portion control	US-HFSSM
5.	Unable to eat healthy and nutritious food	Healthy and nutritious	Author's item based on Indonesia` National Action Plan towards malnutrition
6.	Unable to eat preferred food	Undesirable food	Author's adaptation of the HFIAS item related to preferred food
7.	Eat the same kind of food	Same food	Bangladesh` scale adopted from Webb et al., 2001
8.	Eat fewer meals in a day	Cut meals	Bangladesh` scale adopted from Webb et al., 2001
9.	Go to sleep hungry	Hungry	US-HFSSM
10.	Whole day without eating	Whole day	US-HFSSM

3.4 Study Areas (Jakarta- Bandung- Surabaya)

In order to achieve the objectives of this chapter, a study case was conducted in three big cities in Indonesia, Jakarta-Bandung-Surabaya as the representative of megacities (Figure 3.1). Megacities is a term for cities with at least ten million inhabitants and experienced urban agglomeration in terms of size, population and economic development, and complexity (UN, 2014). The main criterion to identify megacities is the number of the population.

Those three megacities are located on Java Island, which is the island of more than 50 % of the country's population and more than half of Indonesia's economic activity. Based on the 2010 census the population of Java Island was around 136.5 million, this number increased by about 30% in the past 20 years. This population growth is due to the higher birth rate on this island and mass migration from Sumatra, Borneo, and Papua Island. Based on 2012 statistical data from Central Bureau of Statistics, the capital city of Indonesia, Jakarta, has the highest population density and spatial interaction with other cities.

Since 2000, Jakarta has been categorized as a fully urbanized city among those three megacities. Jakarta, the capital city of Indonesia (Figure 3.3), is also one of the largest cities in Southeast Asia region with hold 10.227.628 inhabitants in 2016 (Jakarta in Figures, 2017). In 2010, nearly 20% of the country`s population living in this megacity. In the past thirty years, Jakarta economic` growth has increased significantly and approximately reached 6 % growth every year. This city approximately contributed 20% to the national Gross Domestic Product [GDP] (Rustiadi et al. 2012). In 2016, Jakarta` inflation rate amounted to about 2.3% compared to the previous year. According to the Jakarta Central Statistics Agency

[2017], food is the main contributor of the inflation with 2.77 percent. The rapid rural-urban migration that experienced by Jakarta has jeopardize this city to the issue of food, employment, housing, sanitation, and increasing the number of people below the poverty line (Cahya, 2016). And, in 2016 the number of low-income people in Jakarta reached to 384,3 thousand people.

Figure 3.3: The position of Jakarta city [source: Martinez and Masron, 2020]

The second biggest city on Java Island is Surabaya (Figure 3.4). Surabaya is the capital city of East Java province with 2.8 million people in 2015 (Surabaya in Figures 2017). This city's annual economic growth approximately reached 6% in 2017. The economic progress of Surabaya city is mainly due to trade, services, and communication because its geographical location allows the city to host the main commercial ports, airport and railway of eastern Java to the surrounding cities as well as to the international trade. More than three million containers were turned over in this region each year. Additionally, the trade industry has led to the development of the region's economy and infrastructure. Given its location supports the growth of economic activity making Surabaya is the main attraction for the migrant to find better economic opportunities, especially from the east part of Indonesia, such as Kalimantan, Sulawesi, and people from small islands in the east. Therefore, the share of low-income people in Surabaya city increase every year and in 2017, the number of low-income reached 5.79% of its population.

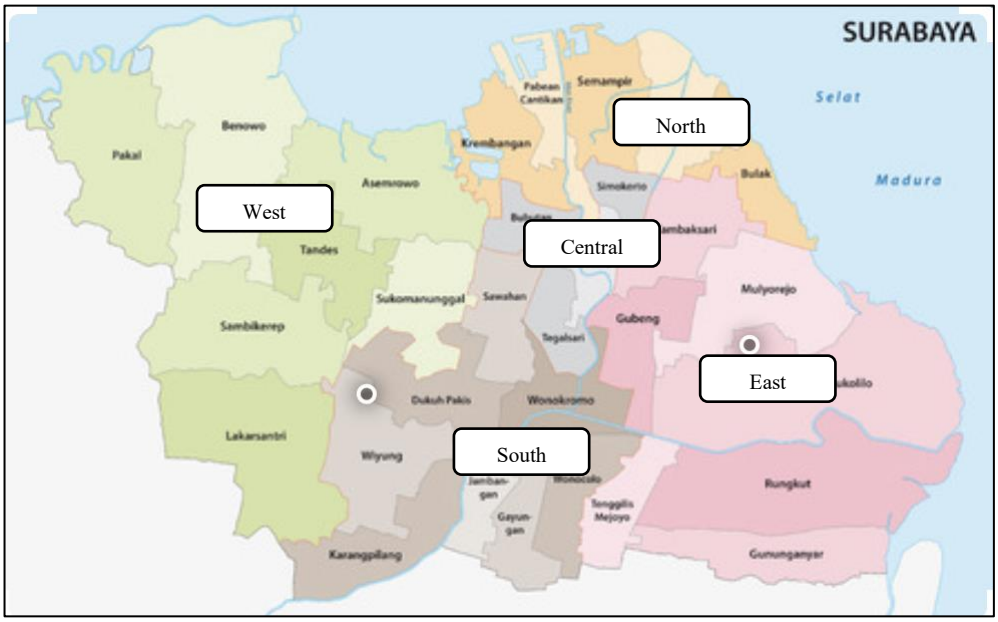

Figure 3.4: The map of Surabaya [Based on various sources, under creative commons attribution license, 2020]

The last city is Bandung. Bandung is the provincial capital of West Java (Figure 3.5), Indonesia, and is the third most populous city in Java after Jakarta and Surabaya (Firman. 2009) with its registered 2.5 million registered residents in 2016 (Tarigan et al, 2016). Every year, Bandung's population growth is approximately about 1% (Bandung City in Figures, 2016). The flourishing food-tourism, agriculture, textile, and apparel industries have led Bandung to the highest economic growth in West Java. Because the tourism industry is the one of main economic contributors in Bandung, every year Bandung sees more than 4 million visitors, both domestic and international (Ghazali and Martini, 2012). Rapid economic development and urban sprawl have created many opportunities and challenges for Bandung, especially regarding maintaining its citizens' well-being. One of the issues of economic development in Bandung is the growth of low-income people.

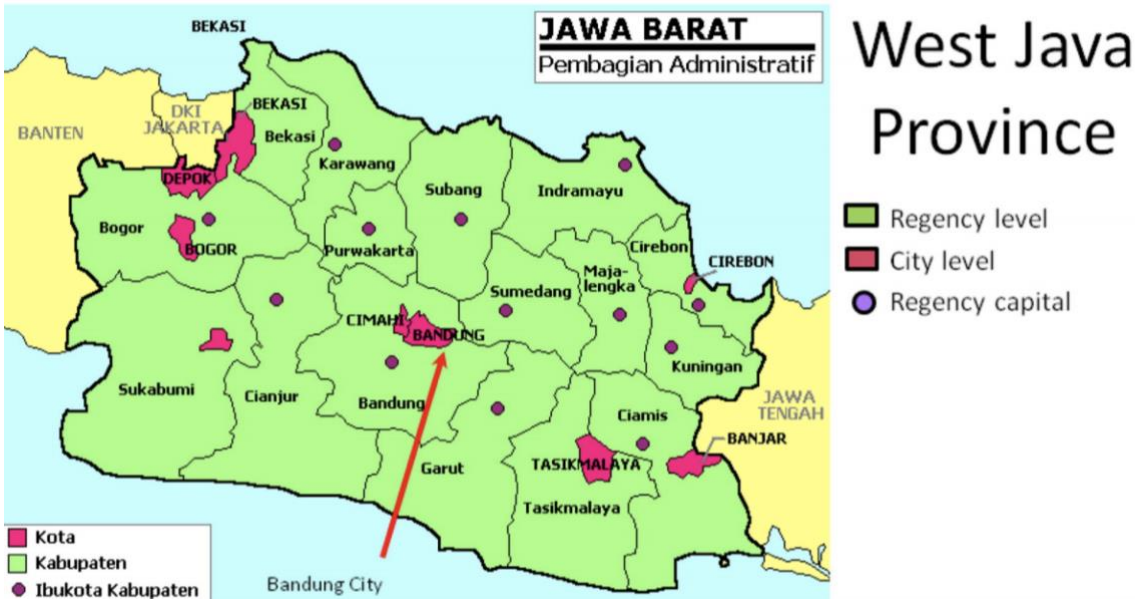

Figure 3.5: The position of Bandung city [source : Tarigan et al.,2016]

3.5 Rasch Model

Rasch model was employed in this study. This confirmatory model is usually used in evaluating the appropriateness of the questionnaire's questions to create the scale. A Rasch measurement model (1966) is the psychometric model that uses the probability concept to estimate the severity level for each item, comprising the measurement scale, and for each individual on the underlying dimension (Gordon 2005).

Compared to other statistical techniques, the determination of the probability of responses to items in the Rasch measurement facilitates the generation of results across samples and items (Gordon 2005; Nord et al. 2016). This model is widely used in health, education, and psychology studies. The Rasch model is appropriate for modelling survey responses; it has been used by the USDA and some studies for developing the food security scale and assessing the validity of the original and adapted versions of the US-HFSSM (Bickel et al. 2000; Coates et al. 2006b; de Toledo Vianna et al. 2012; Rafiei 2009). The models can analyze dichotomous or polytomous responses of the respondent. The key assumption of the Rasch model are: i) monotonicity, which means that households are more likely to affirm the less-severe items than more-severe items and that items are more likely to be affirmed by those who are food insecure, compared to their food-secure counterparts; ii) conditional independence, which means that the likelihood of a household answering `yes` to one questions in the scale is not related with their answer to other items depend on their level food insecurity (Wilde, 2004); iii) equal item discrimination, means that each items construction the scale is equally linked with the latent construct.

In the experience-based food insecurity study, the latent trait is “food insecurity,” and the observed items representing food insecurity are organized along with the

continuum “severity” [Coates et al. 2006]. With all else held equal, the greater the score, the more likely the household is to assert the items. The more severe an item, the less likely the household is to affirm it. A higher number of affirmative responses against the ability level to handle the food insecurity situation indicates a higher number of households facing food insecurity (Hamilton et al. 1997).

In the Rasch model, the value of food insecurity as the latent variable is fixed. For the Rasch model, as the value φ increases while β remains fixed, the probability will increase. The Rasch model is described as follows:

$$P_{ij} = P(X_{ij} = 1|\varphi_j, \beta_i) = \frac{\exp(\varphi_j - \beta_i)}{1 + \exp(\varphi_j - \beta_i)} \qquad \text{(Eq.2)}$$

where X_{ij} is the probability of the affirmative response, β_i represents the difficulty level (severity parameter) of the item, and φ_j is the ability of an individual to give the correct response to the item.

The severity of an item is a continuous scale that represents the severity level of respondents that shows the limit of accepting or rejecting that item based on their experiences. Since this model is the conditional probability of afforming the dichotomous question, the probability that respondents answer the questions is 0.5. After the Rasch item response is estimated, the Internal validity test of the `equal item discrimination` assumption of the Rasch model was performed. This can be assessed by examining fit statistics. These fit statistics provide information on how well a respondent responds to items in the measurement scale. There are two types of fit statistics, infit and outfit. Both values are estimated by comparing the probability of a respondent’s affirmative response under the Rasch model assumption of an item on the respondent’s actual response. Since both the fit statistics analyze

the deviations in responses from the expected deviations calculated under Rasch assumptions, the expected values were, approximately, around 1. The outfit statistic is calculated by dividing the average of the squared error by the expected value of the squared error. The infit-outfit statistics are calculated as follows:

$$z_{ir} = \frac{(X_{ir} - E(X_{ir}))}{\sqrt{Var(X_{ir})}} \qquad \text{(Eq.3)}$$

$$INFIT = \frac{\sum_{i=1}^{I} Var(X_{ir}) * z_{ir}^2}{\sum_{i=1}^{I} Var(X_{ir})} \qquad \text{(Eq.4)}$$

$$OUTFIT = \frac{\sum_{i=1}^{I} z_{ir}^2}{\sum_{i=1}^{I} Var(X_{ir})} \qquad \text{(Eq.5)}$$

For the infit and outfit statistic, SUMS are taken for the item from the non-extreme samples; $X_{i,r}$ is the response of the respondent (r) to item i (1 for affirming the item, 0 for No); $P_{i,r}$ is the probability of an affirmative response by the respondent to item i, given the item's calibration and the estimated level of severity of the prevalence of food insecurity; and N is the number of respondent.

3.6 Analysis and results of Indonesian food insecurity scales

3.6.1 Food insecurity estimation method - Rasch model

The Rasch model analysis was based on 10 items (Table 3.1) that are believed to affect the food insecurity status in the three megacities in Indonesia. The severity parameter is estimated based on the overall patterns of responses given by all respondents, whether they are affirming or denying the items. The more severe an item, the less likely a respondent is to affirm it. Items “Whole day” and “Hungry” are identified as the most severe items on the scale with item severity of 9.79 and 8.77, respectively. These results implied that most respondents rarely experienced both situations in the past 12 months; those items can indicate serious accessibility issues. However, the three-least severe items comprising “worried,” “limited food,” and “balance livelihood” indicated the problem of uncertainty and anxiety about acquiring food due to limited resources.

To identify the item's performance in the food insecurity scale in this sample, we applied infit (Figure 3.6) and outfit statistics (Table 3.2). The item-infit is similar to an information-weighted chi-square that compares the strength of the logistic association for each item with the underlying condition of food insecurity. Infit statistics assessed the appropriateness for the insertion of the item in the questionnaire by assessing which question was different from the average questions in the questionnaire. The lower the infit of the items indicates that the item different from the average. For item` discrimination, interpretation can be drawn from the respondent's answer across the severity level. Based on Rasch's assumption, the food-secure household will have nearly zero probability of giving a "yes" response to all items in the scale. This means that with the increase of the severity level of household

food insecurity, the probability of they will answer "yes" also will decrease. Additionally, the increase in the severity leads to an increase in the probability of a "yes" response.

According to Rasch's assumption, all items in the questionnaire discriminate equally, so a higher or a lower value of an infit item indicates a misfit, and the item's inclusion in the scale is considered improper. According to Nord et al (2002), the acceptable value of infit is in the range of 0.7–1.3. The items in this measurement meet the assumption of the Rasch model that all items are different and equally have item infit values between 0.80 and 1.18.

We also examined item outfit to assess the fit of the data to the Rasch model. The function of the outfit is to measure the improbable responses. A high outfit statistic indicates improbable responses due to misunderstanding of the item by the respondents or may indicate that the item of questions has a weak relationship to the underlying construct of food insecurity. Based on the analysis, the high value of the outfit was in the item “worried”. Since the high sensitivity of the outfit value can be driven by only one or two unexpected answers. Thus, as long as the infit value is in the acceptable range, we can ignore the high value of the outfit.

Table 3.2 Item severity parameters and outfit statistics: Based on the Rasch Model

Indicator item [a]	**% affirmed**	**Severity Parameters** [b]
Worry about food	63	4.48 (0.27)
Worry about balancing the need for food for your family with other basic needs	53	5.40 (0.24)
Limited choices of food	50	5.67 (0.23)
Cut the size of the meal	37	6.69 (0.23)
Unable to eat healthy and nutritious food	36	6.80 (0.23)
Unable to eat preferred food	34	6.85 (0.24)
Eat the same kind of food	30	7.31 (0.24)
Eat fewer meals in a day	21	8.25 (0.28)
Go to sleep hungry	17	8.77 (0.31)
Whole day without eating	11	9.79 (0.42)

Note:
[a] Indicator items are ordered in the table by the severity parameter. This order is different from the administration in the questionnaire.
[b] Standard error in parenthesis. The item ordered by severity parameters are varied, depending on the respondent's experience toward each item.

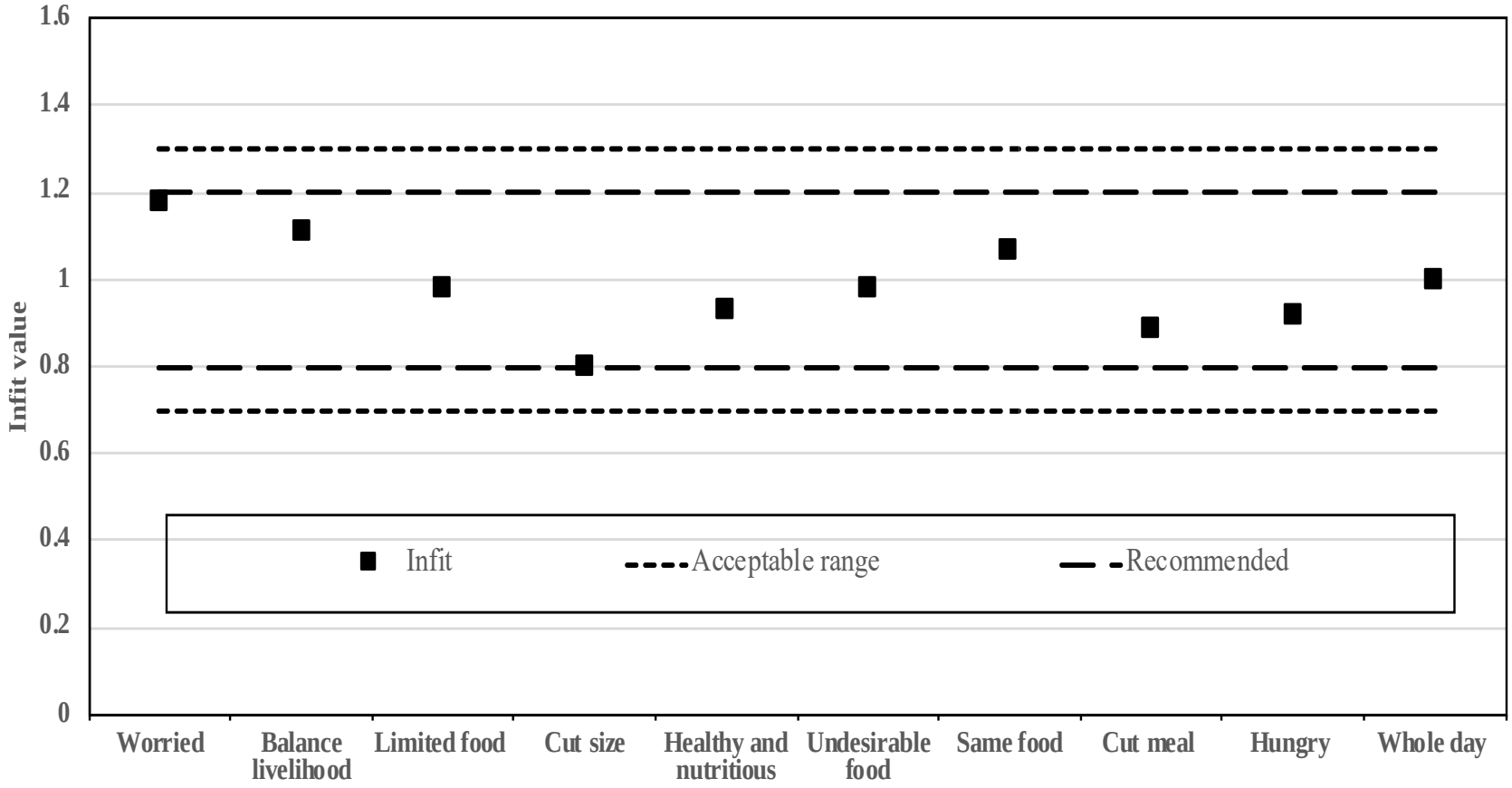

Figure 3.6: Infit statistics of indicator items that are ordered by severity parameter

The internal consistency or item correlation is carried out by calculating Cronbach's alpha (0.82) (Cronbach 1951). The value ranged between 0 and 1. The higher the value, the higher the alpha value ranges from 0 to 1, and the higher will be the item intercorrelation. A value below 0.7 indicates unsatisfactory consistency reliability (Bland and Altman, 1997).

3.6.2 The food insecurity categories

The following two measures of food insecurity are calculated from the scale: the severity values [continuous variables], and the food security status (categorical variables). The severity values of raw scores 0 and 10 are undefined. For this, the respondent-scale severity has a value between –1.48 to 6.79 logistic units (Table 3.2). In this study food secure, marginally food secure, moderately and severe food insecure status of the households were identified. According to table 3.3, 72.6% of respondents who have a raw score between 0 and 5 were identified as food secure, and 27.4% were found to be food insecure. In the status of "food insecure", an experience of all indicators was more frequent, especially the indicator "going a whole day without eating". However, most people in food-insecure conditions rarely experience anxiety about food access.

Table 3.3 Respondent scale scores and categorical thresholds of food security status of low-income urban household in Jakarta, Bandung, and Surabaya

Number of "yes" responses	Rasch Score (Severity) [a]	Percentage of Respondents	Cumulative Percentage	Category
0	Not defined	21.3	21.3	Food secure (45.3%)
1	4.04 (1.14)	8.7	30.0	
2	5.04 (0.90)	15.3	45.3	
3	5.76 (0.81)	7.3	52.7	Marginally food secure (27.3%)
4	6.38 (0.77)	14.7	67.3	
5	6.96 (0.76)	5.3	72.7	
6	7.56 (0.78)	9.3	82.0	Moderately food insecure (16%)
7	8.20 (0.83)	6.7	88.7	
8	8.97 (0.93)	4.0	92.7	Severely food insecure (11.3%)
9	10.03 (1.17)	2.0	94.7	
10 (evaluated at 9.5)	10.76 (1.92)	5.4	100	

Note: [a] Calculated severities have been obtained by adding 4 to severity parameters, in order to ensure that the values are positive. Prevalence rates have been computed for 150 households

The determination of appropriate cut-off points for each category of the food insecurity status was based on the suitable items which could be described with the situation in the country and compared with other countries` scales as the reference. In this study, the comparison analysis with U.S. and Bangladesh scales is carried out. The process of comparison started with the linear transformation of the mean and standard deviation of the same meaning items with the U.S. food insecurity scale and was performed to compare the severity parameter of the proposed scale with adjusted U.S values. For the analysis we used the unadjusted value from the official report of Current Population Survey (CPS) of U.S households food security scale in 1998 (Table 3.4). This illustrative comparison is to show the sensitivity of cut-offs of this study scale and to assess the prevalence number of food insecurity comparable to U.S scale. For instance, this study' raw score 5 (household severity 6.96) (Table 3.3) is

equivalent to the adjusted scale of the raw score 3 (household severity 6.63) (Table 3.6). This means that raw score above 5 in this study is similar to the cut-offs for food insecurity in the U.S. scale.

Table 3.4 U.S. Item calibration value (Source: Bickel et al., 2000)

U.S. Items (Adult)	**Item calibration**
Worried food would run out	1.49
Food bought didn`t last	2.79
Couldn`t afford to eat balanced meals	3.67
Adult cut size of meals	5.37
Respondent ate less	5.55
Adult hungry but didn`t eat	7.54
Respondent lost weight	8.63
Adult did not eat for whole day	9.12

As depicted in table 3.5 and 3.6, there were five common items (worried, portion control, cut meals, hungry, and whole day) with the mean (7.60) and standard deviation (2.07). One-to-one mapping of the item-raw score of the proposed scale with U.S. scales was conducted as depicted in figure 3.7.

Table 3.5 Comparison of item severity parameter (this study scale and U.S scale)

Item	Indonesia (author` scale)	Item	US (1998) CPS item Callibration (Bickel et al., 2000)	US Items severities values adjusted to Indonesia
Worried*	4.48	worried*	1.49	4.28
Balancing food and basic needs	5.4	-	-	-
Limited variety	5.67	-	-	-
Portion control *	6.69	cut size	5.37	7.01
Healthy and Nutritious	6.8	Balanced meal	3.67	
Undesirable food	6.85	-	-	-
Same Food	7.31	-	-	-
Cut meals*	8.25	Cut meals*	7.55	8.53
Hungry*	8.77	Hungry*	7.54	8.52
Whole day *	9.79	whole day *	9.12	9.63
Mean of common items	7.60			
Standard deviation of common items	2.07			

Note: [a] * These items have similar meaning and were used for the adjusting the author`s scales and the U.S. scales.

Table 3.6 Comparison of Household` severity value (this study' scale and U.S' scale)

Raw score	Urban household` severity (This study` scale)	U.S household` severity	U.S household` severity adjusted to this study` scale)
1	4.04	1.72	4.48
2	5.04	3.1	5.32
3	5.76	4.23	6.63
4	6.38	5.23	7.02
5	6.96	6.16	7.30
6	7.56	7.07	7.76
7	8.2	8	8.33
8	8.67	8.98	8.93
9	10.03	10.15	9.64
10	10.76	11.1	10.22
Mean of common items (worried, portion control, cut meals, hungry, wholeday)	7.60		
Standard deviasion of common items	2.07		

Note: [a] The adjustment of the U.S household severity has been obtained by adjusting with the mean and SD of the 5-items which has equivalent meaning (worried, portion control, cut meals, hungry, and whole day)

Figure 3.7: one-to-one mapping of the item-household severities values (This study scale and U.S scale)

Aside from the comparison with the developed country scale (U.S. scale). We also conducted a comparison with the developing country case. We took the data from the Bangladesh survey (Nord, 2002). This scale was based on the ethnographic study conducted in Bangladesh to reveal the local context situation. The questions consisted of 14 sets of items (Table 3.7) with the range of severities from 0.8 to 10.70.

Table 3.7 Items of Bangladesh scale

Items	Items severity
1. Rarely or never cooked good quality food	0.8
2. Ate less food	1.61
3. Rarely or never ate (large) fish	1.82
4. Rarely or never ate meat	2.22
5. Had to borrow food from relatives or neighbors	2.49
6. Food stored in home ran out and no money to buy more	2.75
7. Worried where food would come from	2.90
8. Rarely or never bought chanachur and other snacks	3.67
9. Respondent skipped entire meals so there would be more food for family	3.97
10. Rarely or never ate 3 square meals (full stomach meals) per day	4.33
11. Ate wheat or other grains although wanted to eat rice	4.76
12. Had to borrow food to feed guests	7.86
13. Respondent did not eat for whole day (except Ramadan)	10.02
14. Had to sell or mortgage possessions to get food	10.70

There were three common-worded items between this study scale and Bangladesh's scale (worried, undesirable food, and whole day) with the mean (7.04) and a standard deviation (2.66) (Table 3.8). After employing a linear transformation, we compared this study scale with Bangladesh's scale. According to one-on-one mapping (figure 3.8), the raw score 5 (household severity 6.96) (Table 3.3) is equivalent to the adjusted Bangladesh scale of the raw score 11 (household severity 6.97) (Table 3.9). This means that the raw score above 5 in this study is similar to Bangladesh's cut-offs for food insecurity. In this study's scale, the raw score of 5 is the cut-off point of the marginally food-insecure households. While in Bangladesh's scale, the cut-off point of raw score 11 is for the food insecure household with hunger.

Table 3.8 Comparison of item severity parameter (this study scale and Bangladesh scale)

Items	Indonesia	Items	Bangladesh Items	Bangladesh items severities values adjusted to Indonesia
Worried*	4.48	-	-	-
Balancing food and basic needs	5.4	-	-	-
Limited variety	5.67	-	-	-
Portion control	6.69	-	-	-
Healthy and Nutritious	6.8	-	-	-
Undesirable food*	6.85	-	-	-
Same Food	7.31	Worried*	4.22	4.55
Cut meals	8.25	-	-	-
Hungry	8.77	-	-	-
Whole day *	9.79	-	-	-
		Undesirable food*	8.79	7.95
		-	-	-
		Whole day *	11.84	9.87
		-	-	-
Mean of common items	7.04			
Standard deviasion of common items	2.66			

Note: [a] * These items have similar meaning and were used for the adjusting the author`s scale and the Bangladesh scale.

Table 3.9 Comparison of Household` severity value (this study scale and Bangladesh scale)

Raw score	Urban household' severity (This study` scale)	Bangladesh household` severity	Bangladesh household' severity adjusted to this study` scale)
1	4.04	-0.34	1.18
2	5.04	0.71	2.00
3	5.76	1.43	2.56
4	6.38	2.03	3.03
5	6.96	2.57	3.45
6	7.56	3.1	3.87
7	8.2	3.64	4.45
8	8.67	4.22	4.74
9	10.03	4.91	5.28
10	10.76	5.78	5.96
11	-	7.07	6.97
12	-	8.79	8.32
13	-	10.64	9.76
14	-	11.84	10.70
Mean of common items (worried, undesirable food, whole day)	7.04		
Standard deviasion of common items	2.66		

Note: [a] The adjustment of the U.S household severity has been obtained by adjusting with the mean and SD of the 5-items which has equivalent meaning (worried, portion control, cut meals, hungry, and whole day)

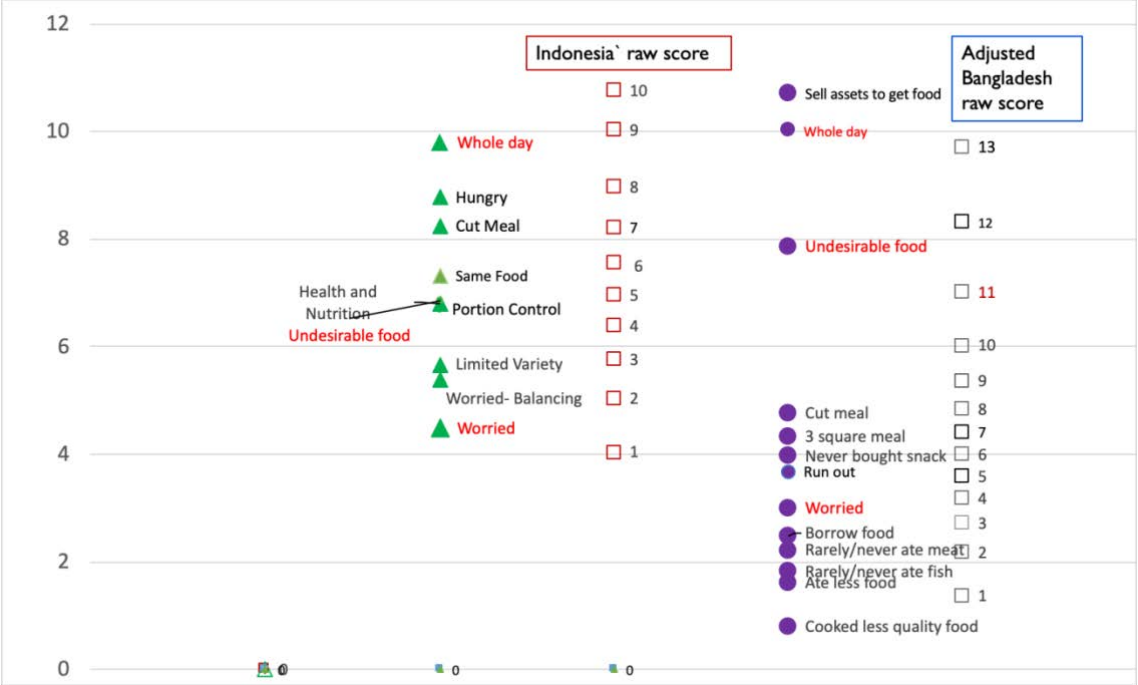

Figure 3.8: one-to-one mapping of the item- household severities values (This study and Bangladesh scale)

In this study, four categories of household food insecurity were grouped as food secure, marginally food secure, moderately and severe food insecure.

Food secure: if the respondents denied all questions in the scale or only affirmed the questions related to "worried"

Marginal food secure: if the respondents answered 3 to 5 items in the scale (items: limited variety, unable to eat healthy food, and portion control)

Moderately food insecure: if the respondents answered 6 to 7 items in the scale

Severe food insecure: if the respondents affirmed more than 7 items

While in the U.S. and Bangladesh scale the households were classified as food secure, food insecure without hunger, and food insecure with hunger. However, we did not adopt the U.S. terms because the concept of hunger is complex and it could

not be concluded by a single measurement and a physiological measurement is required to collect more information about hunger.

The concept and definition of hungry, hunger, and food insecurity are different (National Research Council, 2006). The term hungry refers to the physiological sensation that an individual feels. And being hungry is related to negative affective phenomena and positive affective (Ombrato & Phillips 2021). For instance, some people are pleased to be hungry if they are excited about one kind of food.

In contrast, hunger is referred to as an acute sensory sensation caused by a prolonged involuntary lack of dietary energy and related to negative affect phenomena (Biesalski, 2013; Ombrato & Phillips, 2021; MacCormak and Lindquist, 2019; Ackerman et al., 2022). The term of hunger is related to the concept of the satiety cascade and is used as an indicator of undernourishment (National Research Council, 2006; Beaulieu & Blundel, 2021; Ombrato & Phillips 2021). The level of hunger can be measured by objective methods (e.g., the prevalence of undernourishment, physiological markers) and subjective methods (self-reports) (Shabat-Simon et al., 2018). While, food insecurity is referred to the lack of access to acquire safe and nutritious food and can be experienced to varying magnitudes of severity at the household level (National Research Council, 2006). Experience-based food insecurity scales (EBFSS) are usually used to measure food insecurity at the household level, although hunger is associated with food insecurity, hunger is a different phenomenon (Anderson, 1990, pp. 1575,1576 as cited in National Research Council, 2006).

Even though there is an item or question related to hunger, this item has no specific weight on the experienced-based scale. Therefore, the use of hunger in the classification of food insecurity is challenging because the respondent experience is

not similar to the term of hunger experienced by the individual. According to the National Research Council (2006), food insecurity is a household-level measurement while hunger is an individual. But unlike hunger, food insecurity can occur at different stages of severity. Any researchers and past studies (e.g., Cook et al., 2004; National Research Council, 2006; Chilton, 2009; Maitra & Rao 2015) suggest considering a more appropriate label for food insecurity to avoid the misleading of the term of hunger.

3.7 Conclusions and recommendation

This chapter focuses on the development of urban food insecurity scales in Indonesia. The growth and development of urban Indonesia's economy are not assisted by policy or initiatives addressing urban food insecurity, especially for low-income households. The GOI has three basic strategies to achieve food security for its citizen: (a) stabilizing rice prices; (b) promoting a widespread process of pro-poor growth for a rapidly expanding economy; and (c) allocating direct food subsidies to poor households, through Rastra program. However, mistargeting or elite capture problems still hinder the success of achieving its objectives. Therefore, this chapter investigated urban household food insecurity by using the modified version of the experience-based food insecurity scale. For this study, we proposed an experiential scale that reflected the SDG indicator 2.2.1. Additionally, the constructed or proposed experience-based scale is fulfilled by the Rasch assumptions means that the scale is reliable and valid in measuring food insecurity in the study area (Jakarta, Bandung, and Surabaya). The result of this study also indicated that the prevalence of food insecurity in the three cities was low. However, the concern of urban food insecurity should be included in the urban and national agenda in combating hunger and food insecurity.

For the measurement, we emphasized FAO's (2016) notion that an experience-based "indicator" has good potential for measuring the prevalence of food insecurity in a developing country such as Indonesia, which is relatively cost-effective for national and regional food policymakers. Moreover, international development researchers, academicians, and policymakers from developed and developing countries largely endorsed this measurement to generate data for food security governance. The data generated from EBFSS can be utilised to facilitate the

prioritization of necessary development activities and contribute toward the proper allocation of budget for the targeted needs of vulnerable people in a food-based social safety net such as Rastra and conditional cash transfer program and can be implemented in the food security and vulnerability atlas in Indonesia as a guide in evidence-based analysis to formulate and monitor the food security-related interventions or programs in the urban and rural area. According to Pérez-Escamilla et al. (2012) the data generated from EBFSS is highly multisectoral, inclusive, and resourceful for the country's poverty reduction and hunger eradication strategies. Additionally, this scale has been proven to produce valid information at the municipal and country levels in other countries such as the U.S., Brazil, and India.

We also suggested adapting the experiential indicator in the nationwide survey together with other food security indicators such as dietary diversity and food consumption. Although, at this point, we suggested it only as a direction.

CHAPTER 4 Socio-economic determinant of urban food insecurity. A case study: Indonesia

4.1 Introduction

The issue of food insecurity in developing countries is crucial and has become the main interest among academicians in the field of economics, social science, and medicine. The proximate determinant of urban food insecurity and Indonesia's social assistance program's challenges were outlined in chapter two. The factor that determines as driving factors for the prevalence of food insecurity is different at each level (e.g., Global, regional, household, rural, and urban)

The rapid expansion of the urban economy and high urban population growth in developing countries, threaten urban areas with the growing number of poverty-induced urbanization. The fact that the low-income household in the urban areas has relatively low and uncertain income and job makes access to food limited. The urban households are market-dependent on food, and a large fraction of their income is food purchases. However, international and regional policymakers still see food insecurity as a rural issue. A rural framework of food insecurity is also employed in many countries, including Indonesia, assuming no difference between urban and rural. Its occurrence is mainly because of inadequate food production by the farmer. However, the complex livelihood and urban dwellers' way of gaining access to food differs from their rural counterparts. Thus, the factors that were influencing urban food insecurity may be distinct from rural areas.

This chapter aimed to explore the determinants of urban food insecurity in Jakarta, Bandung, and Surabaya. This information is necessary for enhancing urban

food security in those cities by improving the selection of the target recipient of the food security-related program. So, the food insecure people can be accurately identified and reap the benefit of programs.

4.2 Methodology

To attain this chapter's objectives, a study case was conducted in three big cities in Indonesia, Jakarta-Bandung-Surabaya. The empirical approach was used to identify the socio-economic determinant of urban food insecurity. The methodology of this chapter is shown in figure 4.1.

The theoretical framework of the cause/determinant of urban food insecurity was based on Barret's model (2002) of food insecurity. After that, the survey was conducted with a modified version of an experience-based food insecurity survey in Jakarta, Bandung, and Surabaya. The data for the study was collected using a paper-based questionnaire survey. The questionnaire survey was conducted in the Indonesian language and then back-translated to English. A total of 150 low-income households were surveyed in this study. For the survey, all the respondents` information was kept anonymous. After the data collection, we employed a binary logistic model to investigate urban food insecurity's socio-economic determinants. Treating a household's food insecurity status in the binary method will have more policy implications. Several independent variables were identified in the literature review process. Last, in summary, the policy implication was outlined.

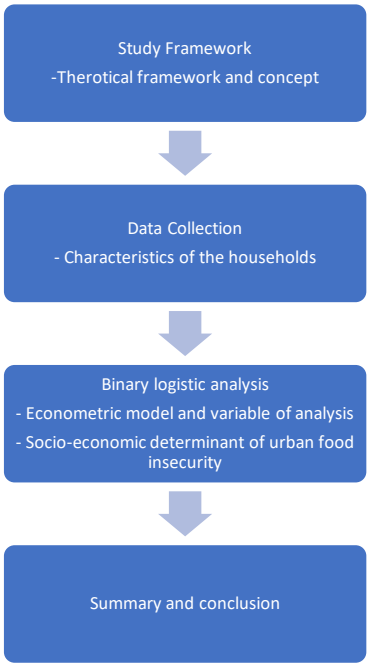

Figure 4.1: Methodology of Chapter 4

4.3 Theoretical Motivation – food insecurity and its proximate determinant.

The dynamic life and high uncertainty of generating income by the low-income household in the urban area motivate this study to use a theoretical rational-choice model of food insecurity by Barret (2002) to build this chapter's research framework. In the household production model (Barret, 2002; Becker, 1965; Gronou, 1976), food insecurity is the issue of risk and uncertainty that a household may experience (Radimer et al., 1992). The household will maximize its utility by choosing the level and pattern of consumption (e.g., food consumption), physical activity, and health condition depending on resource availability and past experiences. The utility in the context is the function of the consumption of food and current and past well-being. Using this conceptual model and the modified version of the experience-based food insecurity scale (chapter 3), in this chapter, we investigate the socio-economic determinants of urban food insecurity in Jakarta, Bandung, and Surabaya.

Addressing urban food insecurity, income generation, and human capital growth is required. The income generation in urban areas is mainly through the manufacturing and service industries. However, determining food insecurity in the urban setting does not lay on income factors alone. Its dynamic and complex situation leads to the other factor that causes food insecurity.

4.4 Data collection – characteristics of the households

The characteristics of the respondents, who voluntarily participated in this study, are listed in Table 4.1. As shown in Table 4.1, most of the sample was composed of females (75.3%), over 60% of whom were of active working age (30-49 years old). Females do more of the daily meal preparation for households than males in a few cases (Broussard 2019; Larson et al., 2019). Some literature also found some differences in how males and females respond to this self-reported food insecurity (Croson & Gneezy 2009; Coates et al. 2010; Kumar et al. 2012; Broussard 2019). For example, males might have a higher tendency than females to under-report self-reported measures of food insecurity. This situation could be due to the psychological effects of responsibility and pride issues related to public reporting that he cannot provide food for his family. In this study, the majority of respondents were female, so the results would possibly be different if the proportion of the male respondent was higher. Of the respondents, 54.7% were immigrants from other cities. More than half had a monthly income under the legally defined minimum regional wage in Indonesia (IDR 3,200,000, approximately, which is equal to USD 211). This study used exchange rates as of June 2018, which were, roughly, 14.476 IDR/US$, according to the central bank of the Republic of Indonesia (Bank of Indonesia 2018. The majority of the respondents had children under 15 years old (57.3%). Concerning the household

dependency ratio, over two-thirds of the household sample had more than one dependent, meaning that most of the households had more dependent members than working-age members. More than 56% of the respondents stated that they lived in their own houses. The rest lived in rented rooms. Of the respondents, 32% were nonpermanent workers

Table 4.1 Characteristics of the participants in the survey (n=150)

Variable	Description	Frequency
Gender	Female	75.3
	Male	24.7
Age	20-29	6
	30-49	62
	50 & above	32
Income [a]	Under the regional minimum wage	63.3
	Above the regional minimum wage	36.7
Employment Status	Nonpermanent	32
	Others	68
Last attained education	Else	53
	High School and above	47
Housing	Own	56
	Rent	44
Household composition	Households with kids (members<15 years of age)	57.3
	Households without kids	42.7
Household dependency ratio [b]	More than 1	61.3
	Less than 1	38.7
Migration status	Yes	54.7
	No	45.3

Note:

The average amount of the regional minimum wage in Jakarta, Bandung, and Surabaya is 3,000,000 IDR (USD 211)

[b] The dependency ratio is calculated as the ratio of non-working-age individuals to working-age individuals.

4.5 Binary logistic analysis

4.5.1 Econometric model and variable of analysis

Methods for analyzing the associated factors of food security were different among researchers, but the logistic regression technique was commonly employed in the previous studies including (Jackson et al. 2019; Soldavini et al. 2019; Ngema et al. 2018; Ahmadi & Melgar-Quinonez 2018; Felker-Kantor & Wood 2012; and Maharjan & Joshi, 2011). The binary logistic model is considered suitable for econometric analysis to estimate the relationship of two-level categorical dependent variables and multiple independent variables, which can be either continuous or categorical variables (Garson, 2016). In this study, the binary logistic model was applied to examine the control of the-nine independent variables on the household's food insecurity status as the dependent variables. Statistical analyses were carried out using STATA 14.0 (Stata Corp LP., USA).

Since household food security status is qualitative, it is binary and can only take two values whether the household is food secure or insecure. Therefore, in this study, a two-level categorical variable was employed. The food secure households were coded one and zero for otherwise. The analysis of food security in a two-level categorical response could provide results that have more practical and policy suggestions (Coleman-Jensen 2011). The construction and categorization of dependent variables are explained in the following section on finding (Section 4.1). Household food security is categorized as food secure if the food security scale's raw score is between 0 and 5, and food insecure if the score is above 5.

The binary logit model assumes a linear relationship between the odds ratio and each independent variable. The benefit of using the logarithm of odds, which is called logit, is to solve the constraint of the linear probability model (LPM) and facilitate

each independent variable's effect on the logit of the odds. If we assume Y_i As the unobservable variable to avoid the circumstance when the error terms differ across observations or are known as heteroscedasticity, then the relationship will be described as:

$$Y_i = \begin{cases} 1 & \text{if } Y_i > 0 \\ 0 & \text{if } Y_i < 0 \end{cases} \qquad \text{(Eq.6)}$$

In order to model the relationship between the subjective food security status and the nine independent variables, the log odds of the probability that an individual is food secure is expressed as:

$$\log\left[\frac{P_i}{1-P_i}\right] = \alpha + \beta_1 X_{1\,i} + \beta_2 X_{2\,i} + \cdots + \beta_k X_k \qquad \text{(Eq.7)}$$

Where α is the intercept or constant term; $\beta_1 - \beta_k$ are the coefficients to be estimated; $X_1 - X_k$ are the explanatory variables. The positive coefficient implies that the explanatory variables increase as the odds ratio increase, and vice versa. The coefficients in equation (6) were estimated using the maximum likelihood estimation (MLE).

This study hypothesized that the socio-economic characteristics as independent variables shown in Table 4.2 potentially determine food security prevalence in the study area. The variables are consistent with the list of socio-economic drivers of food and nutrition security at a household level stated in Pangaribowo et al. (2013) and Haddad et al. (1994).

Table 4.2 Description of the variables used in the model

Variables	Description of Dummy Variables (D)
Dependent variable	
Food security status	D = 1 if respondent is food secure, food insecure = 0
Independent variable	
Gender (G)	D = 1 if respondent is female, else 0 (male)
Age (A)	D = 20-29, 1 =30-49, 2=50-59, 3= >=60
Income (I)	D = 1 below The National Wage Standard, else 0
Migration status (M)	D = 1 if respondent is a migrant, non-migrant =0
Employment type (E)	D = 1 if the respondent permanent work, else 0
Last attained Education status (ED)	D = 1 if the respondent high school graduate and above , else 0
Housing (H)	D = 1 if respondent has house ownership, else 0 (rent)
Dependency ratio (DR)	D = 1 if the ratio of dependents is more than 1 (high), else 0(low)

Note:

- The average amount of Regional Minimum Wage in Jakarta, Bandung, and Surabaya is 3,000,000 IDR (211 USD)

4.5.2 The socio-economic determinant of urban food insecurity

An interesting indication was found from the analysis of the influence of socio-economic characteristics on urban food security. The results of the binary logistic model showed that the Pseudo-R^2 value is 0.55. This indicates that the independent variables can account for more than 50% of the dependent variable in the model. The following explanatory variables are reported as having a statistically significant difference at the 1% level as determinants of the low-income urban households in the studied area: income, employment status, and dependency ratio. Additionally, the respondents' migration and housing statuses are significant at the 5% level. The results are shown in Table 4.3.

Table 4.3 Determinants of food insecurity in Jakarta, Bandung, and Surabaya

Variables	**Coefficient**	**Odds ratio**	**P-value**	**95%. CI**
Gender (female)	0.937	2.552	0.085	(0.880, 7.40)
Age (20-29)	-0.591	0.553	0.559	(0.076, 4.01)
Age (50-59)	0.369	1.447	0.534	(0.451, 4.61)
Age (>=60)	-0.972	0.378	0.245	(0.073, 1.94)
Income (below standard minimum wage)	-2.071	0.126	0.000***	(0.039, 0.39)
Migration status (migrant)	-1.15	0.316	0.020*	(0.120, 0.83)
Employment type (permanent)	1.161	3.193	0.017*	(1.233, 8.26)
Last attained education status (high school graduate)	-0.02	0.972	0.952	(0.386, 2.44)
Housing (Own a house)	1.125	3.082	0.03*	(1.114, 8.52)
Dependency Ratio (above 1)	- 1.663	0.189	0.001***	(0.072, 0.49)
Prob>chi^2	0.000			
Pseudo-R^2	0.3645			

Note: Reference groups were being male, age between 30-49, elementary and junior high school graduate, non-migrant, having income above the regional minimum wage, having non-permanent jobs, rent a house, and having a dependency ratio less than 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In this study, the income factor (below the standard minimum wage) was found to have a negative sign of coefficient, and its effect is significant (OR 0.126 , 95%, CI:0.039, 0.39). This result indicates that having income below the minimum standard wage is at the lesser odds to be food secure than those having income above the regional minimum wage. This could be explained that having income under the minimum wage in the urban area will decline the purchasing power of other basic needs such as housing, education, water, and electricity. The literature has adequate evidence that a household could be at a greater risk of experiencing food insecurity due to income and poverty issues (Rose 1999; Loopstra & Tarasuk 2013; Maitra & Rao 2015; Mahadevan and Hoang 2016). For example, suppose the household's income is insufficient, and the food price in urban areas is high. In that case, the households will manage by eating less nutritious foods and reducing the quantity and frequency of eating. Protection policies are required to address food insecurity in urban areas because the increase in income will gain the households' ability to access food and improve their well-being.

According to Harris-Todaro (1970), Davis and Henderson (2003), and Mckenzie and Rapoport (2010), economic incentives and the probability of getting a job in urban areas are the main factors that contribute toward migration decisions. The attractiveness of the urban area sometimes attracts low-skilled and unemployed workers from rural areas. As shown in the result, the odds ratio of food security variable associated with migration status was 0.316 (95%, CI: 0.12, 0.83). The results show that migrant respondents are at the lesser odds to be food secure compared to non-migrant respondents. This indicates that the importance of the policy on rural development also contributes to eliminating urban poverty that sometimes leads to the food insecurity issue. This finding is also in line with the studies of food insecurity in Latin America and Caribbean countries (Smith et al., 2017). Moreover, household income stability could promote food security (Tarasuk, 2017).

Employment status is also considered an essential factor in determining food insecurity. As presented in table 4.3, it was found in this study samples that employment status has a positive sign of coefficient with 3.193 odds ratio (95%, CI: 1.233, 8.26). This implies that those with permanent jobs have are at greater odds to be food secure compared to those with nonpermanent jobs. This factor is related to the income level status of the respondent. Respondents with permanent employment status and an income above the regional minimum wage are likely to be food secure. Employment affects development objectives. A job is the most crucial asset for many urban residents, especially low-income urban households. An employee's income is higher if the respondent is a permanent employee as opposed to being nonpermanent. Unstable employment and earning opportunities weaken households bargaining power and make them notably vulnerable to shocks while forcing them to compromise with the household's resource availability and sacrifice their access to basic needs (Bartfeld et al. 2006; Nord et al. 2014). These findings are supported by previous literature that the prevalence of food insecurity is associated with the employment status (economic determinant) (Barret 2010; Floro and Swain 2013; Maitra 2014; Tarasuk 2017; Akinboade and Adeyeva 2018).

The development of megacities and population growth due to the high fertility rates and rural-to-urban migration are interconnected. The changes in demography might impact human capital, and policymakers must be aware of such changes. In this study, the question representing the demographic indicator of food insecurity was formulated as follows: Do the household dependency ratio and migration lead to urban food insecurity in Jakarta, Bandung, and Surabaya city? The study results indicate that the working-age adult's share of the non-working-age adult, as reflected by the household dependency ratio, is a robust socio-economic determinant of urban food insecurity. In the estimated model, the dependency ratio has a negative coefficient with an odds ratio value of 0.189 (95%, CI:

0.072, 0.49). This means that households with a dependency ratio above 1 were at lesser odds of being food secure than those with a low dependency ratio. The results indicate that a household's food security improves as the number of dependents decreases. A high dependency ratio within a household implies the heavy burden of dependents that the working household member must support. To the extent that the household is the central unit of consumption and production, the household with insufficient income and a high dependency ratio tend to be less effective at securing food, staying healthy, and rearing children. These outcomes will be driven by food insecurity in the family (Hadley et al., 2011; Mahmudiono et al., 2018).

This study also found that migration and homeownership statuses (housing) were found to influence the food security status at a 5% level (Table 4.3). As presented in table 4.3, it was found in the samples that migration status has a negative sign of coefficient with a 0.316 odds ratio (95%, CI: 0.120, 0.83). This implies that migrant respondents are at greater risk of being food insecure than non-migrant respondents. The non-migrant households tend to be more food secure than migrant. This could be explained by the fact that a household's migration status is one of the more significant threats to food insecurity in urban areas. This is mainly driven by unsustainable rural livelihoods because of decreased farm and low economic base productivity. Rural-urban migration tends to contribute to urban areas' challenges, such as increasing the number of populations and contributing to the quality and quantity of agricultural products from rural areas. In addition, because urban people are highly market-dependent on obtaining food, decreasing the food supply that affects food prices, and housing issues. As a result, urban people might be more vulnerable to experiencing food insecurity than rural people.

The variables of gender, age, and education status were insignificant in the present model. According to the results, females are associated with the OR 2.55 which indicates

that female respondent is greater odd to experience food security than males (95%, CI: 0.880, 7.40), although the results are not statistically significant. Previous studies also supported these results that showed there is a gender difference in experiencing food insecurity (Mohammadi et al., 2011; Felker-Kantor & Wood 2012; Abdullah et al., 2017; Broussard 2019).

4.6 Conclusions and recommendation

This chapter aimed to identify the socioeconomic determinant of urban food insecurity in Jakarta, Bandung, and Surabaya. The theoretical rational-choice model of food insecurity by Barret (2002) was used for this empirical analysis. Based on the analysis, income, employment status, migration status, housing status, and the working-age adult's share to the non-working-age adult dependency ratio] are the socio-economic determinants of urban food insecurity in the study areas.

The significant distinction between the low-income urban poor and rural poor is that the urban population depends mainly on cash for survival. Given the result, addressing urban food insecurity needs a multisectoral approach. For example, the promotion of poverty alleviation, income generation, child nutrition, rural-urban migration policies, and investment in social capital, both urban and rural areas, are necessary to allow the vulnerable people to increase their well-being. Poverty leads to food insecurity and reduces the purchasing power of basic needs, such as housing, energy, water, and proper sanitation.

Overall, investigating the cause of urban food insecurity is essential to policymakers. This information is resourceful for formulating, targeting, monitoring, and evaluating the current food security programs. This is quite important for developing countries like Indonesia, where the issue of mistargeting food security programs remains.

CHAPTER 5 The effect of food insecurity on subjective happiness

5.1 Introduction

The food insecurity status of low-income households in three urban areas in Indonesia was identified in chapter 3. The socio-economic determinant of urban food insecurity is investigated in chapter 4. The past research about the several effects of food insecurity was also discussed in chapter two. This study intends to investigate to what extent food insecurity affects subjective happiness. Although access to resources (e.g., food, education, income, etc.) is improving, low-income people might not reap the benefit appropriately (Dalton 2011, cited Bandura 2009, p.505). These happened because of the lack of consideration of the psychosocial aspect in most social programs and research related to poverty (e.g., subjective happiness).

In the food insecurity context, most social programs and past studies are highly focused on nutritional status, health outcomes, obesity, and stunting. (e.g., Stuff et al., 2004; Gundersen & Kreider, 2009; Seligman et al., 2010; Zingel et al., 2011; Jebena et al., 2017). Most of the studies are highly focused on people's nutritional and health status as the parameter to measure its effect on the quality of life. However, the interaction between food insecurity and one's health outcome is complex and reciprocal (Morales & Berkowitz, 2016; Pérez-Escamilla and Segall-Corrêa, 2008). Meanwhile, in most economic studies, assessing the impact or effect of food insecurity on people's quality of life uses the utility concept. However, that concept directly impacts people's consumption level due to the change in food prices rather than food insecurity.

In the past ten years, due to the growing interest in promoting progress in the quality of life, the call for the investigation of subjective well-being has been increasingly acknowledged as being important among researchers and policy development. Some

researchers (e.g., Koyanagi et al., 2019; Russel et al., 2016; Hadley et al., 2008; Chilton et al., 2007; Kaiser et al., 2004) investigated the impact of food insecurity on well-being, such as anxiety, depression, suicide attempts, and mental health. The investigation of the effect of food insecurity on the subjective well-being or happiness of low-income households is of interest. The main reason is that the dynamicity of challenges faced by low-income households differs from rural counterparts. If this association remains unclear could potentially lead to societal insecurity (Kornher and Sakketa, 2021).

Moreover, most of the current literature focuses on the country level (Salahodiaev & Mirziyoyeya, 2021; Frongillo et al., 2017). Therefore, it is challenging to set direct strategies in progressing quality of life for the specific groups with a high possibility of experiencing food insecurity. As Frongillo et al. (2017) and Diener (2013) acknowledged , investigating people's subjective experience is significantly important in the policy target for food insecurity because this approach offers a broader perspective that typical health indicators could not capture. Since the evaluation of the subjective experience is considered by individuals, it can directly inform about society (Helliwell et al., 2012) and possibly be utilized for post-policy making. Therefore, to fill the gap in the existing literature, this study attempted to investigate the magnitude of the effect of food insecurity on people's subjective happiness. This study will contribute to the current literature in the fields of food insecurity and subjective happiness, which may lead to the enhanced subjective well-being of low-income households in urban areas.

5.2 Methodology

To achieve this chapter's objective, we utilized the household's food insecurity status information in chapter 3 and the self-evaluation of subjective happiness scale. An empirical research approach was used in this chapter. And to understand the effect of food insecurity

on subjective happiness, this study employed two analysis models. Model 1 focuses on socio-economic determinants' effect (chapter four) on subjective happiness, and in model 2, we included food insecurity in the analysis. The flow of the methodology for chapter 5 is shown in figure 5.1.

A comprehensive literature review and theory that constructs the conceptual model for this chapter was conducted. This chapter utilizes approach of relative deprivation and the theoretical rational-choice model of food insecurity. After that, the survey was conducted together with the previous chapter's content. The identities of the respondent are kept anonymous. After the data collection and the analysis of chapters 3 and 4, an ordered logistic model was conducted in this study. The investigation then outlined the policy implications which can be derived from the results.

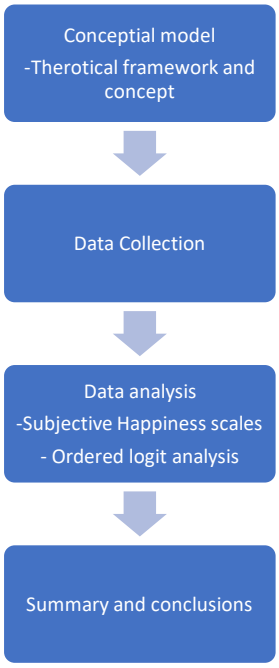

Figure 5.1: Methodology of Chapter 5

5.3 Theoretical framework and conceptual model

To motivate our empirical study, we utilize the theory of relative deprivation (Davis, 1959; Runciman, 1966], the concept from the psychology approach, which explains that

poverty and its associated stimulus affect people's cognition, mood, happiness, and decision making. This approach assumes that the sense of deprivation depends on a person's self-evaluation or comparison with others. Happiness is one of the important themes in psychology. The happiness study differs between "happy" and "subjective happiness". Happy is regarded as a positive emotion, while subjective happiness is the psychological trait linked with a broad concept.

Additionally, this study also utilizes the theoretical rational-choice model of food insecurity by Barret (2002) for this study framework. In the household production model (Barret, 2002; Becker, 1965; Gronou, 1976), food insecurity is the issue of risk and uncertainty that a household may experience (Radimer et al., 1992). In this context, utility means the function of food consumption and current and past well-being.

Through the above theory and models, we hypothesize that unfavorable living conditions (food insecurity status, employment status, dependency ratio, housing, and household income) can decrease the evaluation of happiness, as depicted in figure 5.2.

Figure 5.2: The conceptual model for the association of Socio-economic determinants, food insecurity status, and subjective happiness level.

5.4 Subjective happiness scale [SHS]

In this study, we used the Subjective Happiness Scale developed by Lyubomirsky and Lepper (1999), which comprises four items of questions rated on a bipolar 7-point Likert scale, and averaging responses to the four items compute a single composite score for subjective happiness. The last item on the scale is reverse-coded with a descending sequence. Responses to all four items were combined and averaged into a single score. Thus, the score will be between the range of one to seven. A higher score means increased subjective happiness. The original scale was translated from English to Indonesian and then back-translated to English by the present study author. To perform further analysis, we adopted the technique proposed by Vera-Villaroel (2012). The respondents were classified into three groups: less happy, moderately happy, and happy. The classification was based on the respondent's happiness scores. The mean score below 4.2 was classified as less happy, the mean score above 5.75 was classified as happy, and the score between those means scores were classified as moderately happy.

5.5 Logistic regression model

Two steps measures of regression models were performed. The first model was an ordered regression model of subjective happiness level as the dependent variable, which is discrete. The first model's independent variables are employment status, household dependency ratio, housing ownership status, and income. In the next models, we added food insecurity status to investigate to what extent this variable affects people's subjective happiness. First, we conducted Spearman's correlation analysis among the explanatory variables presented in Table 5.2. Most of the correlation coefficients of the nine-

explanatory variables were significant (P< 0.05) and below 0.70; thus, multicollinearity is not a concern in the present data (Tabachnick & Fidell, 2001).

An ordered logit model was performed to explore the association between socioeconomic determinants, food insecurity, and subjective happiness. Ordered logit is similar to regression models that can accommodate more than one independent variable. Different from multiple-choice models that include utility variables for each alternative, according to (O'Donnel and Connor, 1996), the ordered model has only one latent variable. The ordered logit model that the error term of the latent variable logistic distributed with mean of zero. The net utility for choosing an alternative, y*, is defined by.

$$y^* = \beta` x_j + \in \qquad \text{(Eq.8)}$$

wherex_i is a factor containing the independent variable j, which includes the variables defined in Table 5.1; $\beta`$ is the factor of regression; and $\in$ is the logistic distributed random error terms that allow for uncertainty.

In ordered logit, Y_i is denote as ordinal response variable. The probability of Y_i is defined as Equation 5.2, and for the log-odds probability(S_j) calculated as Equation 5.3. This linear generates coefficients$\beta`$ for each of the independent variables used.

$$\text{Prob}\,(Y_j = i) = \text{Prob}\left(k_{i-1} < S_j + u \leq k_j\right) \qquad \text{(Eq 9)}$$

$$S_j = x_{1j}\,\beta_1 + x_{2j}\,\beta_2 + \cdots + x_{mj}\,\beta_2 \qquad \text{(Eq.10)}$$

In the ordered logit model, the model's fitness is assessed by the Mcfadden, pseudo R^2. The Pseudo R^2 is almost similar to the R^2 in the regression, which is defined as the coefficient of determination to test how well the model's independent variables could explain the dependent variable.

In the logistics regression, the odds ratio (OR) is calculated by exponentiating the regression coefficient ($e^{\text{coefficien}}$). The odds ratio is an effect-size statistic that often use to determine whether the particular exploratory variables contribute to the outcome. This study

use the OR to interpret the effect of independent variable on subjective evaluation of happiness. Data analysis was performed using Stata 14.0 (Stata Corp LP., USA).

5.5.1 The effect of food insecurity on people's subjective happiness

In order to assess how and to what extent food insecurity and its socio-economic determinants are related to subjective happiness, two different models have been estimated in this chapter. The independent variable used in this study is depicted in table 5.1.

Independent variables – food insecurity status. Four categorical level variables, including food secure, marginal food secure, moderate food insecure, and severe food insecure, were generated based on affirmative respondent scores on the Food Insecurity Module (Chapter 3). A score of 0-2 indicated food secure, 3-5 indicated marginal food secure, 6-7 indicated moderate food insecure, and 8-10 indicated severe food insecure. However, this study only considers two categories: food secure for the most desirable level and food insecure for severe ones. In the analysis, the household categorized in the moderate and severe food insecure status was combined into a single group. The main reason is that their number is relatively low in this study (chapter 4). Therefore, the food insecurity status for food insecurity was coded into dichotomies variables, such that 0 = food insecure, 1= food secure.

Table 5.1 Description of the variables used in the model 1 and 2

Variables	Description of Dummy Variables (D)
Dependent variable	
Subjective Happiness	1 = if respondent is belong to less happy group 2 = if respondent is belong to moderately happy group 3 = if respondent is belong to happy group
Explanatory variable	
Gender (G)	0 = if male, 1= if female
Age (A)	0 = 20-29, 1 =30-49, 2=50-59, 3= >=60
Income (I)	0 = else (under), 1= over The National Wage Standard
Migration status (U)	0 = non-migrant, 1= If migrant
Employment type (E)	0 = unemployed and non-permanent, 1= permanent worker,
Last attained Education status (ED)	0= else 1 = high school gradute and above
Housing (H)	0 = else (rent), 1 = if respondent has ownership,
Dependency ratio (DR)	0 = else (low), 1= if the ratio of dependents is more than 1
Food insecurity status (FI)	0 = if food insecure; 1 = if respondent is belong to food secure

In this study, we included a socio-economic determinant variable (Chapter 4) and basic socio-economic characteristic [age, gender, education, and migration status of the respondent] that might determine the subjective happiness outcome. Therefore, we have two models in the analysis.

- **Model 1** (Figure 5.3) includes subjective happiness as dependent variables and employment status, household dependency ratio, housing ownership status, and income as independent variables.
- M**odel 2** (Figure 5.4) we added food insecurity status to examine the effect of food insecurity on the people` subjective happiness.

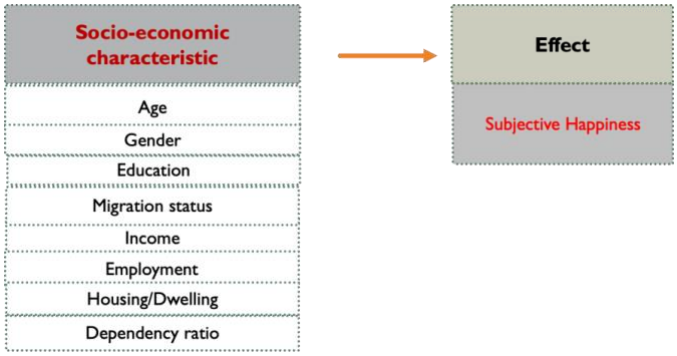

Figure 5.3: Model 1- ordered logistic of socio-economic characteristic, socio-economic living condition, and subjective happiness

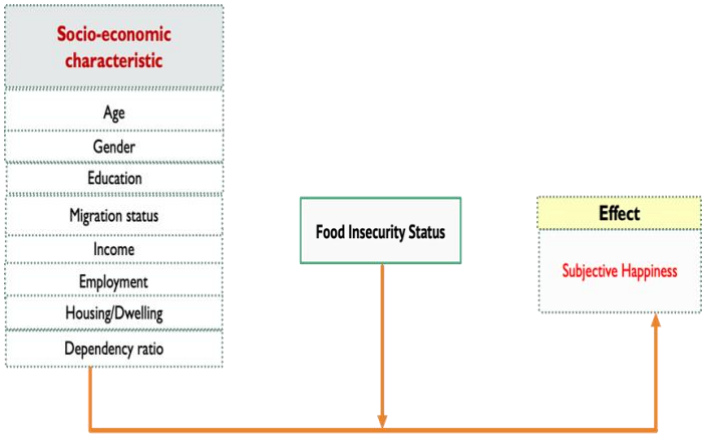

Figure 5.4: Model 2- ordered logistic of socio-economic characteristic, socio-economic living condition with household food insecurity status, and subjective happiness

Table 5.2: Description and proportion of the variables used in model 1 and 2

Variables	Description	Mean or proportion (%)
Independent variables – Living Conditions		
Food insecurity [a]		
Food secure	Score 0-2	45.3
Marginally food secure	Score 3-5	27.3
Food insecure	Score 6 -10	27.4
Income [b]	Under the regional minimum wage	63.3
	Above the regional minimum wage	36.7
Employment status	Nonpermanent	32
	Permanent	68
Housing ownership status	Own	56
	Rent	44
Household dependency ratio [c]	More than 1	61.3
	Less than 1	38.7
Independent variables – Basic socio-economic characteristic		
Age	20-29	6
	30-49	62
	50-59	21.3
	60 and above	10.7
Gender	Female	75.3
	Male	24.7
Education	Else	53
	High school and above	47
Migration status	Migrant from rural	54.7
	Non-migrant	45.3
Dependent variables - SHS		
Overall mean (continuous)	Subjective Happiness status (range 1-7)	4.92
Mean (discrete)	Subjective Happiness score classified in three levels	3.86
	1 = less happy	
	2 = moderately happy	4.95
	3 = happy	6.09
Proportion	Subjective Happiness score coded in 3 levels	37
	1 = less happy	
	2 = moderately happy	31
	3 = happy	32

Table 5.3 Spearman` correlation among independent variables

	I	E	H	DR	FI	A	G	ED	M
Income (I)	1								
Employment status (E)	-0.016	1							
Housing (H)	0.034	0.124	1						
Dependency Ratio (DR)	0.181*	-0.277*	-0.115*	1					
Food Insecurity status (FI)	-0.303*	-0.296*	-0.264*	0.512*	1				
Age (A)	0.027	-0.026	0.225*	-0.032	-0.064	1			
Gender (G)	0.117	0.137	0.216*	0.181	0.082	-0.002	1		
Education (ED)	0.139	-0.045	0.002	-0.056	-0.025	0.118	0.163*	1	
Migration Status (M)	-0.129*	0.136*	-0.003	0.173*	0.242*	-0.070	-0.007	-0.019*	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The investigation of subjective happiness has gained more interest among development economists and academicians. This topic is increasingly used to clarify the various socio-economic context. The model 1 chi^2 and Mcfadden`s pseudo $R^2$ were found to be significant, as shown in Table 5.4. Based on the result depicted in Table 5.5, this study found that in Model 1, subjective happiness was associated with basic socio-economic characteristics, and the socio-economic living condition` variables such as migration status, income, housing, and dependency ratio.

Migration status has a positive coefficient and is statistically significant, with the odds ratio value of 1.87. This result indicates that most rural migrants are happier than non-migrants. Though some rural migrants might encounter some challenges that come with migration (Aksel et al., 2007), to some extent, their quality of life is higher after migration (Hendriks, 2018). Additionally, the gained happiness by migration also not only depends on economic condition but non-economic (Hendriks & Bartram, 2015; Hendriks, Ludwigs, & Veenhoven, 2016).

The respondent's income level has a negative coefficient and significantly affects the subjective happiness evaluation, with the odds ratio (OR) being 0.74. This result indicates that the respondent with an income below the standard minimum wage has lesser odds of being happier than the one with a higher income. The finding of the income variable in the first model is supported by the tunnel effect theory (Hirschman and Rothschild, 1973] that happiness will decrease as the individual's income is low than the average in society. As a result, the higher income gap will affect the individual's overall evaluation of life satisfaction. This situation is highly occurring in the urban area due to the competitive nature of having a job and high living costs. Most happiness research in economics has shown that having limited income causes less happiness (Easterlin, 2003; Knight & Gunatilaka, 2010; Tibesigwa et al., 2016; Rahayu, 2016; Yu et al., 2019). However, Cevik and Tasar (2016) found in their study that income level was not contributed to their rural sample. The possible explanation for this difference is that rural residents might still be able to explore more economic opportunities.

Housing status is seen to have a positive coefficient and was found to contribute significantly to subjective happiness. The existing studies also support this result (Hu, 2013; Ruprah, 2010; Tienfenbach & Kohlbacher, 2015). This finding adds to evidence that asset ownership, in this regard, house ownership, can influence people's self-esteem and confidence. Also, homeowners might be able to maintain or control their lives in balance with other basic needs. This situation would be highly found in the urban areas in developing countries as the growing population, and limited land availability is not well-accommodated by a clear urban housing development. It is also interesting to note that having a house in urban areas could negatively affect subjective

happiness (Elsinga and Hoekstra 2005; Parker et al. 2011), especially in urban areas, if the owners have the financial burden of owning a house.

The dependency ratio was found to have negative signs and statistically significant to contribute to subjective happiness. This indicates that having less dependence makes the respondent happier. Further, this confirms that the dependency ratio also plays an important role in people's subjective happiness. Knight & Gunatilaka (2010) found that in urban China, if migrants must support more dependents in the family, which will decrease their happiness score.

Furthermore, some happiness studies show that there is a complex association between employment and subjective happiness. This study also showed that having stable work or employment contributes to the level of subjective happiness, but it is not statistically significant. The findings align with (Warr 1999; Wingkelmann 2005; and Shams 2014) conclusion.

As for the odds ratio (OR) value of each variable (Table 5.5], this study revealed that the OR of having income below standard regional wage was 0.74 (95%, CI: 0.383, 1.46). This indicates that the respondents with income below the standard are less likely to have a higher subjective happiness score than those with income above the standard minimum wage. For the variable housing, the urban respondents with owning a house have greater odds of having higher happiness (OR 1.13, 95%, CI : 1.573, 6.17) compared to the respondents without owning a house. The odds ratio of subjective happiness associated with the migration status variable was 1.87 (95%, CI : 0.983, 3.59), which indicates that the respondents who are migrants are at greater odds of having high subjective happiness compared to non-migrant groups. A high household dependency ratio was found to have 0.47 odds ratio (95%, CI: 0.24, 0.94). This indicates that the increase in the number of dependents in the households makes the

respondent have lesser odds of being happy than the respondent with a lower number of the dependents.

Table 5.4 Model 1 Significance

LR chi^2	**Prob > chi^2**	**Pseudo R^2**
28.48	0.001	0.0872

Table 5.5 Ordered logit result for Model 1

Independent Variables	**Coef.**	**OR**	**P > z**	**95%,CI**
Socio-Economic Characteristic				
Age (20-29)	-0.045	0.95	0.949	(0.239, 3.82)
Age (50-59)	0.134	1.14	0.745	(0.507, 2.58)
Age (>60)	-0.048	0.95	0.929	(0.327, 2.77)
Gender (Female)	-0.097	0.90	0.806	(0.417, 1.97)
Education (high school graduated and above)	0.115	1.12	0.722	(0.593, 2.12)
Migration Status (migrant)	0.630*	1.87	0.05	(0.983, 3.59)
Socio-Economic Living-condition				
Income (below regional standard wage)	-0.289	0.74	0.396	(0.383, 1.46)
Employment (permanent)	0.637	1.89	0.081	(0.924, 3.87)
Housing (own)	1.136***	3.11	0.001	(1.573, 6.17)
Dependency ratio (above 1)	-0.739*	0.47	0.035	(0.240, 0.94)

Note: Reference groups were being male, age between 30-49, elementary and junior high school graduate, non-migrant, having income above the regional minimum wage, having non-permanent job, rent a house, and having a dependency ratio less than 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The inclusion of food insecurity in the second model was associated with having less happiness after considering the other independent variable factors (Table 5.6). The existence and extent of food accessibility issues among households, especially those categorized as low-income households, is of interest because this condition is considered a basic measure of population well-being. The result of model 2 is depicted in table 5.7. The model -2 The chi^2 and Mcfadden's pseudo R^2 were found significant,

as shown in Table 5.6. Adding the food insecurity variable in model 2 increased pseudo-McFadden's (pseudo R^2) from 0.872 to 0.1856. From the ordered logistic analysis, we found that there were only three significant variables: income, housing, and dependency ratio. Food insecurity status replaces various variables that affect a respondent's subjective satisfaction, such as migration status and dependency ratio, which appeared to have been statistically significant in model 1. The findings emphasize that migration variables have a pseudo effect on people's subjective happiness or influence subjective happiness indirectly. Previous research on the subjective well-being of urban migrants (Stillman et al., 2015; Chen et al., 2019; Szaboova et al., 2021] has found that migrant's hardship [e.g., material hardship, poor social experience] often results in a lower level of subjective well-being. However, previous research hasn't looked into how much migration variables and the hardship situation affect a migrant's subjective happiness in the city.

The food insecurity status was found to have a negative coefficient. This indicates that having a food insecure situation would contribute to a decrease in subjective happiness. However, some existing studies found that some people might still be happy despite the lack of food accessibility. This could happen if the household has the supporting and managing mechanism (e.g., borrowing food or exploring new economic opportunities) to encounter this situation, only possibly to be implemented in rural areas (Gartaula et al., 2017). However, these mechanisms are difficult to implement in the urban context. The poor people, especially the urban poor, are more likely to report hardship when facing more circumstances, even without psychological distress. This study's finding aligns with the theory of relative deprivation and other studies on why some individuals with very low-income and low-food expenditures report relatively having an unhappy feeling. For example, Frongillo et al. (2017) note

that the importance of food insecurity is the critical factor of subjective well-being than other socio-economic factors because the concern related to food accessibility is closely associated with unhappy feelings and results in lower well-being.

Additionally, as depicted in table 5.7, the odds ratio of food insecure was 0.08 (95%, CI: 0.033, 0.21), implying that respondents in food insecure situations are at lesser odds of being happy than food secure respondents. The respondents with income below regional standard had OR 0.44 (95%, CI: 0.215, 0.92), which indicates that the respondent who belongs to this category is at lesser odds of having high happiness score compared to its counterpart that has income above the regional minimum standard. Interestingly, the magnitude of the effect in the second model significantly contrasts with the first model. As found in the first model, the odds of households with an income below standard minimum wage are 0.74. In contrast, after the inclusion of the food insecurity variable in model 2, the odds of households with income above the minimum standard have become 0.44. This result supports the previous studies conducted by Ball and Chernova (2008) that income has a strong and positive association with happiness especially for low-income households. Their happiness would increase as their income increases in order to help them out of poverty. However, the effect of income on the respondent's subjective happiness compared to other variables, such as food insecurity status have less impact. This phenomenon is also explained by Frongillo et al. (2017), Rojas & Guardiola (2017), and Asfahani et al. (2019], which highlights the crucial position that having access to food plays a role in people's subjective well-being rather than other socio-economic variables such as income, and employment.

Additionally, those with a house are more likely to have higher happiness (OR=2.09, 95%, CI: 1.011, 4.35) than those renting a house. Even though in model 2,

the food insecurity status is included, the housing status remains significant. This result suggests that housing/accommodation issues in urban areas are also keys to people's subjective happiness. Overall, food insecurity status plays a more significant role among other independent variables to potentially move people from the less happy group to moderately happy and to the happy group.

This study adds to the evidence that the lack of access to food contributes to the subjective evaluation of happiness more than other aspects, including income and housing. The findings could be explained by Maslow's hierarchy concept (1943), feeling secure in all aspects of basic needs could increase and develop people's self-esteem and sense of belonging. However, experiencing food insecurity, having inadequate housing, and living in poverty make the people less concerned about their potential, make it hard to develop relationships, and make people move down the hierarchy. These phenomena could be explained by the fact that once an individual experiences hunger, her/his focus will be on how to eliminate or go through from hunger than on anything else. And because humans need to be recognized and appreciated when their basic needs are not completely met, resulting in a feeling of discomfort, weakness, and helplessness (Maslow, 1943). Achieving people's self-esteem and happiness means developing family welfare in different dimensions. Though some existing studies, for example, a study conducted by Weismann (2017), found that people could report having good self-esteem regardless of their basic needs not being fulfilled, we could not find such phenomena in this study. The overall results are important for filling the gap in the research regarding food insecurity and policy, in which the consideration of the subjective well-being (psychosocial) aspect is a recommended contribution, and this is just a direction that this study suggests based on the results.

Table 5.6 Model 2 Significance

LR chi^2	Prob > chi^2	Pseudo R^2
60.63	0.000	0.1856

Table 5.7 Ordered logit result for Model 2

Independent Variables	Coef.	OR	P > z	95%, CI
Socio-Economic Characteristic				
Age (20-29)	0.248	1.28	0.746	(0.284, 5.78)
Age (50-59)	0.005	1.01	0.990	(0.436, 2.31)
Age (>60)	0.392	1.48	0.504	(0.467, 4.68)
Gender (Female)	-0.372	0.68	0.380	(0.299, 1.58)
Education (high school graduated and above)	0.190	1.21	0.582	(0.613, 2.38)
Migration Status (migrant)	0.644	1.90	0.065	(0.961, 3.77)
Socio-Economic Living-condition				
Food Insecure	-2.469***	0.08	0.000	(0.033, 0.21)
Income (below regional standard wage)	-0.804*	0.44	0.031	(0.215, 0.92)
Employment (permanent)	0.282	1.32	0.471	(0.615, 2.85)
Housing (own)	0.741*	2.09	0.047	(1.011, 4.35)
Dependency ratio (above 1)	-0.166	0.84	0.667	(0.397, 1.80)

Note: Reference groups were being male, age between 30-49, elementary and junior high school graduate, non-migrant, food secure, having income above the regional minimum wage, having non-permanent job, rent a house, and having a dependency ratio less than 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Some past studies found that the influx of people to urban areas can drive many social problems and insecurity, including the well-being of the urban residents (Plaut, 2002; Safi, 2010; Cook, Dwyer, & Waite, 2011; Arpino and Valk, 2017). However, based on the model above (model 2), migration status is become insignificant to be associated with subjective happiness after the variable food insecurity is being included in the model. This indicates that migrant status has a pseudo effect on people's subjective happiness. Therefore, an interaction analysis was performed to

clarify that migration status moderates the effect of food insecurity on subjective happiness.

5.5.2 The interaction model between migration status and food insecurity among migrants in the study area

In some past studies (e.g., Wen & Wang, 2009; Knight & Gunatilaka, 2010; Huang et al., 2017; Yu et al., 2019; Bonnefond & Mabrouk, 2019) have found that socioeconomic factors (e.g., gender, income, employment) have a significant role in people's subjective happiness. However, in those studies, little attention has been paid to the effect of migration status and its interaction with other socioeconomic and circumstances variables (food insecurity) on subjective happiness.

The independent variable used in this study is depicted in Table 5.8. Prior to the logistic regression analysis, the crude analysis between subjective happiness and all socioeconomic variables was conducted (Table 5.9). The data showed similar trends between migrant and non-migrant respondents regarding their subjective happiness level when they experienced food insecurity. The migrant respondents who are in a food-insecure situation and less happy are 68.75%, and the non-migrant respondents who are in a food-insecure situation and less happy are 66.67%. However, a logistic regression analysis was performed to clarify the pseudo effect of migration status on subjective happiness.

The model fitness is shown by the interaction of the migration status variable with the socio-economic variables is described in Table 5.10. The ordered logit result (Table 5.11) showed that two interaction variables were statistically significant, 1) migration – dependency ratio, and 2) migration – food insecure. The OR for migration-

dependency ratio is 0.161 (95%, CI:0.029, 0.888], which indicates that respondent who is migrants and have a dependency ratio above one at a lesser odds of having high subjective happiness compared to non-migrant groups. The dependency ratio indicates the proportion of working-age individuals in a household that can support nonworking-age individuals (children and elderly). Most urban migration literature emphasizes that the movement transforms and improves migrants' livelihood and reduces poverty (Garnier et al., 2002; Clemens et al., 2014; Wang et al., 2019). However, a high dependency ratio among the migrants would lead to an "economic debacle" in the household because it affects several aspects of household ecology. As a result, the households will be less efficient in maintaining their livelihood and lowering their subjective well-being. This study's findings emphasize that the combination of movement to rapidly growing cities with a high dependency ratio would affect subjective happiness. As mentioned by Knight & Gunatilaka (2010) and Stillman et al. (2015), the phenomenon is called the emergence of miserable migrants, which could be due to missed expectations of the migrants about their future household ecology, urban living condition, and urban aspiration.

The OR for the interaction between migration and food insecurity status was significant with the OR 0.087 [95%, CI: 0.009, 0.787], which indicates that the respondents who are migrants and in food insecure situations are lesser odds of having high subjective happiness compared to non-migrant groups. This occurs because many rural-urban migrants perceive that moving to the city will improve their material circumstances. In actuality, most of them often end up in the urban informal sector, where the economic situation and living conditions are typically precarious (Yu et al., 2019; Smith & Wesselbaum, 2020). The result also confirmed the study conducted by Siddiqui et al. (2021), the migrants potentially faced many circumstances, including

insecurity to access food and low subjective well-being. This finding clarified or magnified what has been found in models 1 and 2, that migration status affects subjective happiness moderated by food insecurity status. The result also shows that the migrants who are being vulnerable to food insecurity feel left behind compared to non-migrant. Thus, the finding emphasizes that the urban food security policy should also accompany by the migration policy to achieve the well-being of the urban residents, especially in megacities such as Jakarta, Bandung, and Surabaya, which are reported to have high rates of migration. This finding also offers a further implication for sustainability city and urban planning context.

Table 5.8 Description of the variables used in the logistic regression model for ordered logistic regression in section 5.5.2

Variables	**Description of Dummy Variables (D)**
Dependent variable	
Subjective Happiness	1 = if respondent is belong to less happy group 2 = if respondent is belong to moderately happy group 3 = if respondent is belong to happy group
Explanatory variable	
Gender (G)	0 = if male, 1= if female
Age (A)	0 = 20-29, 1 =30-49, 2=50-59, 3= >=60
Income (I)	0 = else (under), 1= over The National Wage Standard
Migration status (U)	0 = non-migrant, 1= If migrant
Employment type (E)	0 = unemployed and non-permanent, 1= permanent worker,
Last attained Education status (ED)	0= else 1 = high school graduate and above
Housing (H)	0 = else (rent), 1 = if respondent has ownership,
Dependency ratio (DR)	0 = else (low), 1= if the ratio of dependents is more than 1
Food insecurity status (FI)	0 = if food insecure; 1 = if respondent is belong to food secure

To highlight this section, the results of the three models were combined and reflected in table 5.12. As depicted in table 5.2, there were several points that significant and needed to be highlighted. First, the model-fitness indicators show that model 3 is the highest among others. This finding emphasizes that the interaction model provides a good

fit for data. Second, though some variables such as income and housing, this finding could indicate that models 1 and 2 are overestimated, and they stand as the main/direct effect on subjective happiness. Third, the other independent variables in model 3 (e.g., gender, housing status, and employment) do not interact with the migration status on the subjective happiness level. However, the estimated coefficient shows that having a house and a permanent job for the migrants would increase their level of subjective happiness. Therefore, comprehensive research in an urban setting should be conducted to gain more empirical evidence of the effect of the food security context and other variables (e.g., years of migration, the social influence) on migrants' subjective happiness.

Table 5.9 Demographic data on household' food insecurity status and subjective happiness by migration status

Food Insecurity status		**Less Happy**		**Moderately Happy**		**Happy**	
	Total	Total	Row (percentage)	Total	Row (percentage)	Total	Row (percentage)
Total	150	55	36.7	46		49	
Yes	41	28	68.2	13	34.2	0	0
No	109	27	25	33	30.1	49	44.9
Migrant							
Total	82	34	40.2	30		18	
Yes	32	22	68.75	10	31.25	0	0
No	50	12	24	20	40	18	36
Non- Migrant							
Total	68	21	30.8	16		31	
Yes	9	6	66.67	3	33.33	0	0
No	59	15	25.4	13	22.1	31	52.5

Table 5.10 The model significance for ordered logistic regression - the interaction model between migration status, food insecurity and socio-economic variables on the subjective happiness

LR chi^2	Prob > chi^2	Pseudo R^2
82.43	0.000	0.2524

Table 5.11 Ordered logistic regression of model 3 - the interaction model of migration status, food insecurity status, and socio-economic variables on subjective happiness status

Variable	Description value	Coef.	OR	P > z	95%, CI
Education	High school	-0.238	0.787	0.613	(0.313, 1.981)
Gender	Female	-0.342	0.709	0.527	(0.245, 2.053)
Dependency Ratio	Above 1	0.388	1.475	0.460	(0.526, 4.135)
Food Insecurity status	Insecure	-2.023	0.132	0.003**	(0.035, 0.494)
Income	Below standard minimum wage	-1.169	0.310	0.032*	(0.106, 0.904)
Housing	Own	0.964	2.622	0.073	(0.914, 7.523)
Age	20-29	-1.63	0.195	0.244	(0.012, 3.049)
	50-59	-0.091	0.912	0.871	(0.300, 2.770)
	>60	-0.188	0.828	0.800	(0.193, 3.551)
Employment	Permanent	0.289	1.335	0.583	(0.475, 3.75)
Migration status	Migrant	1.61	5.022	0.222	(0.376, 67.09)

Migration*Age	Migrant*20-29	2.93	18.86	0.109	(0.519, 684.45)
Migration*Age	Migrant*50-59	-0.101	0.904	0.914	(0.144, 5.642)
Migration*Age	Migrant*>60	2.27	9.71	0.113	(0.583, 161.98)
Migration*Gender	Migrant*Female	-1.102	0.331	0.252	(0.05, 2.187)
Migration*Education	Migrant*High school graduate	1.558	4.75	0.05	(0.991, 22.76)
Migration*insecure	Migrant*yes	-2.439	0.087	0.03*	(0.009, 0.787)
Migration*Income	Migrant*below standard	0.176	1.193	0.83	(0.237, 5.98)
Migration*Dependency ratio	Migrant*above 1	-1.825	0.161	0.036*	(0.029, 0.888)
Migration*Housing	Migrant*own	0.07	1.08	0.924	(0.218, 5.36)
Migration*Employment	Migrant*full-time	0.04	1.04	0.961	(0.198, 5.46)

Note: Reference groups were being male, age between 30-49, elementary and junior high school graduate, non-migrant, food secure, having income above the regional minimum wage, having non-permanent job, rent a house, and having a dependency ratio less than 1. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5.12 The summary of result of model 1, 2, and 3

Independent Variables	Model 1	Model 2	Model 3
	Coef.	Coef.	Coef.
Socio-Economic Characteristic			
Age (20-29)	-0.045	0.248	-0.163
Age (50-59)	0.134	0.005	-0.091
Age (>60)	-0.048	0.392	-0.188
Gender (Female)	-0.097	-0.372	-0.342
Education (high school graduated and above)	0.115	0.19	-0.238
Migration Status (migrant)	0.630*	0.644	1.61
Socio-Economic Living-condition			
Food Insecure		-2.469***	-2.023**
Income (below regional standard wage)	-0.289	-0.804*	-1.169
Employment (permanent)	0.637	0.282	0.289
Housing (own)	1.136***	0.741*	0.964
Dependency ratio (above 1)	-0.739*	-0.166	0.388
Interaction with Migration status			
Migrant*20-29			2.93
Migrant*50-59			-0.101
Migrant*>60			2.27
Migrant*Female			-1.102
Migrant*High school graduate			1.558
Migrant*food insecure(yes)			-2.439*
Migrant*Income (below regional standard wage)			0.176
Migrant*Dependency ratio (above 1)			-1.825*
Migrant*Housing(own)			0.07
Migrant*Employment(permanent)			0.04
Pseudo R2	0.0872	0.1856	0.2524
LR chi^2	28.48***	60.63***	82.43***

5.6 Conclusions of the chapter and recommendations

In conclusion, the results of model 1 and model 2 imply that experiencing food insecurity significantly contributes to people's subjective happiness. The more insecure a household tends to be less happy. This happened because of neuroticism, which worries, and anxiety also occur when a household experiences food insecurity. The other aspects, such as housing, income, and dependency ratio, contribute to increasing the change of people to be less happy. The potential policy implications from our findings are:

1. Reducing food insecurity could improve subjective happiness as the proxy of subjective well-being, especially in urban contexts.
2. Having inadequate access to food may critically affect the psychosocial condition of the residents. Therefore, it is essential to formulate an effective urban policy and urban food security initiatives that reduce the economic barriers to affordable food for socioeconomically disadvantaged people. For instance, promote urban agriculture, and initiate an urban safety net program that might be targeted on employment criteria, house ownership, or the number of dependents in the family. Those strategies or initiatives would potentially benefit low-income households, release them from the poverty trap, and increase their level of proactivity in society.
3. The finding has a strong policy that emphasizes that the policy aimed for food insecurity is not only focused on measuring access to economic aspect to reduce insecurity but also focusing on the migration aspects for creating a more livable and sustainable city for all the people.
4. This study adds to the evidence that subjective well-being or happiness is potential as the supplementary monitoring criteria of food security strategies. As stated by Bandura (2009), "failure to address the psychosocial aspect is often the weakest

link in social policy initiatives. Simply providing ready access to resources does not mean that people will take advantage of them." However, at this point, we can only suggest it as a direction, and a comprehensive assessment is needed to confirm how food insecurity contributes to overall happiness.

CHAPTER 6 Summary and Conclusions

6.1 Summary and conclusions

This chapter concludes the significant findings of all chapters in the dissertation. It highlights the theoretical and methodological contribution to food insecurity studies. The motivation of this study was to pursue a better understanding of urban food insecurity and its effect. The policy implication and the direction of further research regarding urban food insecurity were outlined.

Chapter one provided a general problem statement concerning food insecurity in urban areas. The author identified that the focus of the food insecurity issue is mainly in rural areas, and to some extent, urban food insecurity remains unnoticed by the policymaker. This phenomenon hampers the government's effort to improve urban food security needs and shows the insufficiency of the instrument or policy design specifically for urban areas. Moreover, policy actions or interventions to achieve urban food security may differ from those that address rural food security. Therefore, the investigation of urban food insecurity is necessary. The specific objectives were set for the investigation in chapters three, four, and five.

Chapter two provided a literature review of urban food insecurity, experience-based measurement of food insecurity, and program-related food insecurity in Indonesia as the study area. This chapter summarized the approach of food security measurement, the development and implementation of experience-based urban food insecurity, the determinant of food insecurity in the urban context, and the measurement of subjective happiness and the concern of urban food insecurity globally and in Indonesia. The author found that experience-based food insecurity

scales have many strong points among other food insecurity measurements: 1) relatively easy to interpret, 2) less costly and time to identify the target group that might reap the benefit from food security-related programs, 3) can be utilized for better understanding of the driving factor and the effect of experiencing food insecurity, 4) the questions are simple and relatively easy to be understood by the respondent, 5) one of the SDG indicators.

This measurement has been shown as highly reliable and modified in many cross-cultural and economic settings (e.g., India, Brazil, Bangladesh, Iran, etc.). However, the adaptation and psychometric assessment of the scales in Indonesia's setting is still limited. The application of an experience-based food insecurity scale can be used to investigate the cause of food insecurity in a broader context. In the past 15 years, the author found that many scholars have realized that exploring the determinant of food insecurity in the urban context is more than just an income and employment issue. Moreover, most food insecurity research is still rural-centric. Therefore, a study focusing on urban settings can further understand the cause and effect of urban food insecurity for better policy intervention.

Chapter three investigated the food insecurity level/status in Jakarta, Bandung, and Surabaya. This chapter aimed to construct and validate the modified version of the experiential-based measurement of food insecurity (FI) and investigate households' food insecurity status/level in the study area. The study showed that based on the Rasch model assumptions, all the items in the modified version of experience-based food insecurity were reliable in measuring food insecurity. In addition, comparing this study scale with the U.S. and Bangladesh scales showed that the cut-off point has a similar pattern. This chapter also confirmed four categories of

households' food insecurity status (food secure, marginally food secure, moderately food insecure, and severely food insecure). The overall prevalence of food insecurity in study areas was low.

Chapter four investigated the determinant of urban food insecurity. This chapter's objective was to identify the socio-economic determinant of urban food insecurity in Jakarta, Bandung, and Surabaya city. The study found that some socio-economic determinants (employment type, income, migration status, house ownership, and dependency ratio) are found to be associated with the prevalence of urban food insecurity in those three cities.

Chapter five investigated the effect of experiencing food insecurity on people's subjective happiness as a proxy of subjective well-being. The concept of food insecurity and well-being are complex. However, the impact of experiencing food insecurity on the people on people's well-being may be investigated not only by their health and nutritional status but also by the people's perceived feeling of happiness. The study revealed that food insecurity status has a higher odds ratio and effect on the respondent's subjective happiness than other independent variables. The result of this chapter also emphasizes that the migration variable has a pseudo impact on the respondents' subjective happiness after the variable of food insecurity is included in the model. Therefore, further investigation has been conducted to clarify that migration status has moderated the effect of food insecurity on subjective happiness. The result shows that the respondents who are migrants and in food insecure situations have lower odds of having high subjective happiness than non-migrant groups.

Overall, the investigation explored several key findings. Chapters one and two discussed the background and significance of the study of urban food Insecurity. Chapter three discussed the modified version of the experience-based food insecurity scale (EBFSS), which identified the study area' food insecurity status. The study found the prevalence of food insecurity in the three study areas was low. Chapter four investigated the socio-economic determinant of urban food insecurity. Some socio-economic determinants were associated with the prevalence of urban food insecurity. Chapter five mainly investigated the effect of experiencing food insecurity on the subjective happiness of the people. This study has practical and theoretical implications that the related stakeholders can utilize. The contribution and recommendations of the area of improvement in further research were outlined.

6.2 Contributions of the study

6.2.1 Theoretical and methodological contributions

The study provides important theoretical and methodological contributions to food security measurement literature, especially experience-based food insecurity measurement. The application of EBFSS in this study contributes to the global initiatives to compare its validity in a different cultural setting to facilitate interventions and strategies to meet the country's target in improving food security so that the food access issue can be monitored across populations and regions. This study's results also contribute to the literature on applying self-reports for the measurement of subjective well-being.

6.2.2 Policy implication of the study findings

The study findings over the policy recommendations for urban food insecurity generally and Indonesia specifically. First of all, the result showed that most of the respondents in Jakarta, Bandung, and Surabaya were food secure. However, this should not make the stakeholder less concerned with the urban food insecurity issue since it is a complex phenomenon. Additionally, this study's finding informs the policymakers that interventional programs of the "Zero-hunger" strategy for urban poor households need to be expanded by considering the multisectoral approach together with other relevant programs (e.g., rural development programs, rural-urban migration programs, entrepreneurship, and education programs). For example, policies towards improving urban food security must also emphasize housing initiatives and, at the same time, provide accessibility to resources (e.g., food, income, education, etc.). Moreover, the various and specific factor of urban-related determinant and effect of food insecurity is essential to be identified by considering the aspect of the individuals, such as the location of residence, subjective well-being, and connectivity to the infrastructure.

Another critical policy implication of the finding is that the experience-based food insecurity measurement has the potential as a supplementary scale to measure food accessibility issues in Indonesia. With the existing measures such as health and nutritional measurement and dietary intake, the information generated by EBFSS can help the policymakers evaluate the conditional cash transfer program (e.g., the family hope program in Indonesia) and recognize food insecure people more accurately. Implementing EBFSS in the Food Security and Vulnerability Atlas (FSVA) or in the

national survey, like in Brazil, will eventually be mandatory if Indonesia is to progress towards reducing hunger by 2030, as articulated in SDG 2.1.

The Brazil case has shown that the inclusion of EBFSS in their national survey was able to record more than a 20% decrease in hunger prevalence between 2004 and 2009. This measurement can be a guide in evidence-based analysis to formulate food security-related interventions or programs in urban and rural areas.

The lack of accessibility to food contributes to an overall evaluation of happiness. This means that the effect of food insecurity on people's subjective happiness adds to evidence that food is not only for satisfying the biological and physical requirements to survive but also an approach to achieving the overall quality of life. Even though some people could be compromised with the situation because of their community support and their point of view of overall life. Achieving happiness is not only the goal but also has a broader meaning for increasing individual and household welfare in a different context. According to the findings, the author suggests 1) it would be ideal for increasing the benefit of the level of food security-related programs; 2) the integration and coordination between urban food security and migration policy agenda should be emphasized to increase the welfare of the low-income households (e.g., wage subsidies, access to a job, entrepreneurship empowerment) to reduce the multiple facets of insecurity faced by them ; 3) the inclusion of the subjective well-being aspect as a part in the formulation and monitoring food security program; 4) the policy aimed for food insecurity is not only focused on measuring access to economic aspect to reduce insecurity but also focusing on the migration aspects for creating a more livable and sustainable city for all the people. The consideration of the psychosocial aspect in social policy initiatives

would have a broader impact on society. The above recommendations are just directions to solve urban food insecurity in Indonesia. However, further analyses are required to give more robust policy recommendations.

6.2.3 Study limitations and further research direction

Aside from the scholarly contributions to the food insecurity study. This study has some limitations that present opportunities for further research. First, the results have limited representativeness due to the relatively small sample size of the participants. The generalizability of these results to people whose members live in other residential locations is unknown. Therefore, a larger number of samples is needed to get more valid results.

Second, some of the participants in this study were categorized as having an income above the regional standard. The income classification might be the source of the bias in interpreting the results. Some of the households are categorized as having an income above the regional standard but IDR 2,500,000 (USD 200); according to the district database, some are classified as social assistance beneficiaries. One of the factors is that these households have few able-bodied workers in relation to the dependent household members. Therefore, the households were categorized as low-income households. So, to reduce the bias and get more comprehensive results, we suggest in the future study that the income parameter should be by real amount rather than grouping based on the standard regional wage

Third, regarding the recall period, this study employed 12 months recall time horizon. However, considering different recall periods is necessary for further study (e.g., 30 days and seven days) when experiencing food insecurity is transient. So, the

urban food insecurity issues, which are varied, could be identified by obtaining and comparing relevant data from the appropriate recall period. Achieving SDGs is also dependent on having accurate data and information available.

Forth, setting the cut-offs for categorizing the household's food insecurity status is one of the weaknesses of this experience-based measurement. The cut-off points are highly relying on the subjective judgment of the researcher. Therefore, the panel or expert judgment must be pursued in further study to get more reliable cut-offs.

Fifth, self-reported data on food security were utilized in this case. Thus, the bias challenge might be handed out. Therefore, to improve the subjective assessments across the regions or populations, the application of anchoring vignettes is recommended to strengthen the psychometric characteristic.

Sixth, the author suggests the income parameter should be by real amount rather than grouping based on Indonesia`s standard regional wage. So, we could get a more detailed income on the effect of income on the prevalence of urban food insecurity.

Last, we only investigate subjective happiness as the proxy of well-being. First, a more in-depth examination to reveal a more nuanced relationship between food insecurity and specific aspect of food-related life satisfaction and well-being could be conducted further, as well as the literature development in the context of food well-being. Second, the causal relationship between food insecurity and subjective happiness is unidentified. Therefore, a larger data set, the application of the qualitative approach, and the other aspect of the evaluation of subjective well-being (e.g., aspiration and satisfaction with life) are essential to be integrated into the

analysis. Third, a crucial area that explored in this study is the role of social and institutional support that promotes food-related well-being to design more effective interventions to reduce urban food insecurity.

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APPENDICES

Appendix A
Questionnaire form in Indonesian Language

Yth Saudara/i responden yang terpilih,

Perkenalkan nama saya Vicka Kharisma, mahasiswa di salah satu perguruan tinggi di Tokyo

Seiring dengan berkembangnya laju ekonomi dan urbanisasi di Indonesia, kebutuhan akan pangan di kota-kota besar pun semakin meningkat. Hal ini dikarenakan pangan dan makanan merupakan bahan yang sangat penting bagi manusia sebagai sumber energi untuk dapat melakukan aktivitas sehari-hari. Oleh karena itu, berbagai aspek mengenai pangan dan makanan seperti pola konsumsi, kesehatan dan nutrisi menjadi sorotan yang penting akhir-akhir ini.
Melalu kesempatan ini, dengan rendah hati kami memohon 10-15 menit waktu anda untuk berpartisipasi dalam survey ini, dan diharapkan anda dapat memberikan jawaban seobjektif mungkin sesuai dengan apa yang anda alami. Kami menjamin kerahasiaan dan jawaban anda hanya akan digunakan untuk kepentingan akademik.

Terima kasih atas kesediaan dan partisipasinya, semoga dapat bermanfaat demi kemajuan Indonesia.

Salam,

Vicka Kharisma

Apabila Saudara memiliki pertanyaan dan informasi mengenai survey ini, Saudara dapat menghubungi : vicka.kharisma@gmail.com

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Bagian I (Berilah tanda **(√)** pada jawaban saudara)

1. Jenis Kelamin
   ☐ Laki-laki
   ☐ Perempuan
2. Status
   ☐ Single
   ☐ Menikah
3. Usia anda saat ini
   ☐ 20-29 tahun
   ☐ 30-49 tahun
   ☐ 50-59 tahun
   ☐ ≥ 60 tahun
4. Pendidikan terakhir
   ☐ Tidak sampai SMA
   ☐ SMA dan sederajat
   ☐ Perguruan tinggi dan sederajat
5. Apakah anak anda tinggal dengan anda saat ini ?
   ☐ Tidak ☐ Iya
6. Apakah anda memiliki anak usia dibawah 15 tahun?
   ☐ Tidak
   ☐ Iya (Berapa:)

7. Pekerjaan anda saat ini
   - ☐ Ibu rumah tangga
   - ☐ Karyawan tetap
   - ☐ Karyawan kontrak/ harian
   - ☐ Memiliki usaha sendiri
   - ☐ Pensiunan
   - ☐ Lainnya (_____)

8. Pendapatan atau uang saku rata-rata setiap bulan
   - ☐ ≤ IDR 1,000,000
   - ☐ IDR 1,000,001 - IDR 2,500,000
   - ☐ IDR 2,500,001 - IDR 4,000,000
   - ☐ > IDR 4,000,001

9. Berapa banyak yang tinggal di rumah saat ini (termasuk anda)
   ☐ 1 ☐ 2 ☐ 3 ☐ ≥ 4

10. Berapa **orang** jumlah tanggungan anda
    ☐ Tidak ada ☐ ≤ 3 ☐ > 3

11. Jenis kepemilikan tempat tinggal anda
    - ☐ Sewa/Kontrak
    - ☐ Milik Pribadi

12. Apakah anda memiliki kampung halaman (**daerah asal dimana anda lahir dan besar**) ?
    - ☐ Tidak (lewati no.13 sampai 15)
    - ☐ Iya (Sebutkan:)

13. Sudah berapa lama anda tinggal di Kota ini ?
    - ☐ Kurang dari 1 tahun
    - ☐ 1- 3 tahun
    - ☐ lebih dari 3 tahun

14. Apa tujuan anda pindah ke kota ini?
    - ☐ Belajar
    - ☐ Bekerja
    - ☐ Belajar dan Bekerja
    - ☐ Lainnya (Sebutkan:)

15. Berapa kali anda berpindah tempat kerja semenjak anda tinggal di kota ini?
    - ☐ Tidak pernah
    - ☐ 1
    - ☐ 2 – 4
    - ☐ lebih dari 4 kali

16. **Jenis subsidi** mana yang menurut Anda lebih penting
    - ☐ Subsidi untuk pangan dari pemerintah (**Contoh: subsidi beras sejahtera "Rastra", Bantuan Pangan Non-Tunai "BPNT"**)
    - ☐ Subsidi untuk energi dari pemerintah (**Contoh: subsidi BBM atau listrik)**

17. Pilih dan urutkan dari 1 sampai 8 berdasarkan tingkat prioritas anda kategori dibawah ini,
    (Catatan: **1 mengindikasikan paling penting dan 8 mengindikasikan kurang penting)**

Kategori	Urutan Prioritas
Makanan	
Listrik	
Pekerjaan	
Pendidikan	
Transportasi	
Air	
Pengelolaan Sampah	
BBM	

18. Pilih dan urutkan kategori berikut ini dari **1 sampai 7** berdasarkan tingkat prioritas anda dalam memilih makanan (Notes: **Urutan 1** merupakan kategori yang **Sangat Penting bagi Anda, sedangkan urutan 7** berarti kategori tersebut **tidak cukup penting bagi Anda**)

Kategori	Urutan prioritas
Daya tarik sensorik (contoh: Rasa yang enak; terlihat menarik; baunya enak)	
Suasana Hati (contoh: membuat hati anda senang atau tenang)	
Nutrisi dan Kesehatan (contoh: mengandung banyak vitamin dan mineral; kaya akan serat dan protein, dsb)	
Harga (contoh: harganya murah atau mahal)	
Kebiasaan (contoh: yang biasanya anda konsumsi sejak anda kecil)	
Kemudahan (contoh: Mudah didapat; mudah dalam pengolahan dan penyajian)	
Kekenyangan (contoh: porsi yang besar, membuat anda puas/kenyang)	

19. Dalam 12 bulan terakhir, apakah **Anda pernah merasa khawatir**, apabila Anda dan keluarga **kehabisan makanan sebelum Anda memiliki uang untuk membeli lagi**?
    - ☐ Tidak (Lewati No.20, lanjut ke No. 21)
    - ☐ Iya (Jawab No.20)

20. **Jika iya**, Seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

21. Dalam 12 bulan terakhir, apakah **Anda atau anggota keluarga tidak dapat mengkonsumsi makanan yang anda dan keluarga sukai dikarenakan kurangnya sumberdaya ?**
    (contoh: bahan pangan sulit didapat/ tidak terjangkau untuk membeli)
    - ☐ Tidak (Lewati No.22, lanjut ke No. 23)
    - ☐ Iya (Jawab No.23)

22. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

23. Dalam 12 bulan terakhir, apakah **Anda atau anggota keluarga anda harus mengkonsumsi variasi makanan yang ala kadarnya dikarenakan keuangan yang terbatas**?
    - ☐ Tidak (Lewati No.24, lanjut ke No. 25)
    - ☐ Iya (Jawab No.24)

24. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

25. Dalam 12 bulan terakhir, apakah **Anda pernah mengurangi porsi makanan dikarenakan terbatasnya dana yang dilmiliki?**
    - ☐ Tidak (Lewati No.26, lanjut ke No. 27)
    - ☐ Iya (Jawab No.26)

26. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

27. Dalam 12 bulan terakhir, apakah **Anda pernah tidak makan seharian dikarenakan terbatasnya dana untuk membeli makanan ?**
    - ☐ Tidak (Lewati No.28, lanjut ke No. 29)
    - ☐ Iya (Jawab No.28)

28. **Jika iya**, Seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

29. Dalam 12 bulan terakhir, apakah **Anda atau keluarga Anda harus mengurangi jumlah waktu makan daripada biasanya karena terbatasnya jumlah makanan yang dimiliki?**
    (contoh: Biasa makan 3 kali sehari manjadi 2 atau 1 kali sehari)
    - ☐ Tidak (Lewati No.30, lanjut ke No. 31)
    - ☐ Iya (Jawab No.30)

30. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

31. Dalam 12 bulan terakhir, apakah **Anda atau anggota keluarga Anda pernah tidur dalam keadaan lapar dikarenakan tidak cukupnya makanan?**
    - ☐ Tidak (Lewati No.32, lanjut ke No. 33)
    - ☐ Iya (Jawab No.32)

32. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

33. Dalam 12 bulan terakhir, apakah **Anda atau anggota keluarga Anda harus makan jenis makanan yang sama dan tidak bervariasi setiap hari?**
    - ☐ Tidak (Lewati No.34, lanjut ke No. 35)
    - ☐ Iya (Jawab No.34)

34. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

35. Dalam 12 bulan terakhir, apakah **Anda dan keluarga tidak bisa mengkonsumsi makanan dengan gizi yang seimbang (4 sehat 5 sempurna)?**
    - ☐ Tidak (Lewati No.36, lanjut ke No. 37)
    - ☐ Iya (Jawab No.38)

36. **Jika Iya**, seberapa sering hal ini terjadi?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

37. Dalam 12 bulan terakhir, **apakah Anda pernah merasa cemas/kesulitan dalam menyeimbangkan kebutuhan makanan untuk keluarga anda dengan kebutuhan dasar lainnya?**
    - ☐ Tidak (Lewati No.36, lanjut ke No. 37)
    - ☐ Iya (Jawab No.38)

38. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

Bagian II – Bagian ini (pertanyaan 39-50) ini ditujukan bagi responden yang memiliki putra/putri berusia dibawah 15 tahun.
Catatan: Bagi yang tidak silahkan lanjut ke Bagian III

39. Dalam 12 bulan terakhir, apakah **Anda pernah mengurangi porsi makan anak anda karena terbatasnya dana yang anda miliki?**
    - ☐ Tidak (Lewati No.40, lanjut ke No. 41)
    - ☐ Iya (Jawab No.40)

40. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

41. Dalam 12 bulan terakhir, apakah **Anda pernah mengandalkan variasi makanan yang ala kadarnya bagi anak anda dikarenakan dana yang terbatas untuk membeli makanan yang lebih bervariasi?**
    - ☐ Tidak (Lewati No.42, lanjut ke No. 43)
    - ☐ Iya (Jawab No.42)

42. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

43. Dalam 12 bulan terakhir, apakah **anak anda pernah tidak dapat mengkonsumsi makanan dengan asupan gizi yang seimbang (4 sehat 5 sempurna)?**
    - ☐ Tidak (Lewati No.44, lanjut ke No. 45)
    - ☐ Iya (Jawab No.45)

44. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

45. Dalam 12 bulan terakhir, apakah **anak anda pernah mengeluh merasa lapar karena kurangnya ketersediaan makanan di rumah?**
    - ☐ Tidak (Lewati No.46, lanjut ke No. 47)
    - ☐ Iya (Jawab No.46)

46. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

47. Dalam 12 bulan terakhir, apakah **berat badan anak anda meningkat atau menurun secara drastis ?**
    - ☐ Tidak (Lewati No.48, lanjut ke No. 49)
    - ☐ Iya (Jawab No.48)

48. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

49. Dalam 12 bulan terakhir, apakah **Anda pernah merasa khawatir/cemas untuk menyeimbangkan kebutuhan makanan anak anda dengan kebutuhan dasar lainnya?**
    - ☐ Tidak (Lewati No.50, lanjut ke bagian III)
    - ☐ Iya (Jawab No.50)

50. **Jika Iya**, seberapa sering hal ini terjadi ?
    - ☐ 1 – 3 kali dalam 1- 2 bulan
    - ☐ lebih dari 4 kali dalam beberapa bulan
    - ☐ Hampir setiap bulan

Bagian III
Petunjuk:
Lingkarilah salah satu point dari 1 s.d 7 yang mencerminkan keadaan diri anda, untuk setiap pernyataan di bawah ini :

1. Bagaimana perasaan (suasana hati) anda saat ini:
   Kurang Bahagia Sangat Bahagia
   1 2 3 4 5 6 7
2. Pada dasarnya, diri saya bahagia
   Sangat tidak setuju Sangat setuju
   1 2 3 4 5 6 7

3. **Dibandingkan dengan orang lain**, saya adalah orang yang bahagia

Sangat tidak setuju						Sangat setuju
1	2	3	4	5	6	7

4. Ada beberapa orang yang tetap merasa bahagia meskipun berada dalam keadaan terbatas atau pun sulit. Apakah anda menilai diri anda sama seperti orang-orang tersebut

Tidak sama sekali						Sangat setuju
1	2	3	4	5	6	7

Dear participant,

Thank you for agreeing to take part in this survey measuring customer preference towards Bandung's Food.

As the economy of Indonesia grows and the urbanization continues further in the nation, food demand in cities is rapidly growing too. Because food is necessary for all and vital for the health, it is one of the fundamental needs for human beings. Thus, more and more attentions are now being paid to the various aspect of food such as safety, accessibility, and environmental load associated with the food production and consumption.

For those reason, as a first step, we are investigating people`s preferences and their determinants on food choice to envision a sustainable food system in Indonesia. The collected information would help us to consider how we could make food system sustainable.

This time, we would like to ask 10-15 minutes of your time to complete this survey. Be assured that all answers you provide will be kept in confidentiality and for academic purpose only.

Best regards,

Vicka Kharisma

If you have any questions or would like more information on our data collection please contact
kharisma.v.aa@m.titech.ac.jp or vicka.kharisma@gmail.com

Part I (Please check (√) the answer)

1. Gender
   ☐ Male ☐ Female
2. Status
   ☐ Single ☐ Marriage
3. Age
   ☐ 20-29 years ☐ 30-49 years
   ☐ 50-59 years ☐ ≥ 60 years
4. Last attained education
   ☐ No high school
   ☐ High school or equivalent
   ☐ College or above
5. Do you have children who stay with you?
   ☐ No ☐ Yes
6. Do you have children under 15 years old?
   ☐ No ☐ Yes (How many:)
7. Occupation
   ☐ Home duties, full time
   ☐ Employed, permanent
   ☐ Employed, non-Permanent
   ☐ Entrepreneur
   ☐ Retired ☐ Others
8. Monthly household income (IDR=Indonesian Rupiah)
   ☐ < IDR 1,000,000
   ☐ IDR 1,000,001 - IDR 2,500,000
   ☐ IDR 2,500,001 – IDR 4,000,000
   ☐ > IDR 4,000,001
9. How many people in your household (include yourself)?
   ☐ 1 ☐ 2 ☐ 3 ☐ ≥ 4
10. How many dependent members of your household?
    ☐ None ☐ ≤ 3 ☐ > 3
11. What is the type of your house ownership?
    ☐ Rent ☐ Private
12. Do you have home town?
    ☐ No (Skip Q13 - Q15)
    ☐ Yes (Specify :)
13. How long have you been in this city?
    ☐ less than 1 year
    ☐ 1- 3 years

☐ more than 3 years

14. What is your purpose to stay in this city? **(please choose one)**
    ☐ Study
    ☐ Work
    ☐ Study and Work
    ☐ Others (Specify:)

15. How many jobs have you worked for since the first time you migrated to this city?
    ☐ None
    ☐ 1
    ☐ 2 – 4
    ☐ more than 4

16. Which one is more important for you ? **(please choose one)**
    ☐ Subsidy for food from government (Example: Raskin)
    ☐ Subsidy for energy from government (Example: Subsidy for gasoline)

17. Please rank eight following items below, according to your priority (1-8).
    (Notes: **1 indicate higher priority and 8-less priority**)

Category	Priority
Food	
Electricity	
Job	
Education	
Transportation	
Water	
Waste management	
Gasoline	

18. Please rank seven following food purchasing motives for your daily consumption, according to your priority.
    (Notes: **1 indicate higher priority and 7 less priority**)

Category	Priority Ranking
Sensory Appeal (Example: good taste; looks good)	
Mood (Example: makes you happy or relax)	
Health and Nutrition (Example: contains a lot of vitamin and mineral; high in fiber and protein, etc.)	
Price (Example: cheap or expensive)	
Familiarity (Example: usually I eat)	
Convenience (Example: easy to get or cook)	
Satiation (Example: large quantity, makes you fell satisfy)	

19. In the past 12 months, **did you worry that your household will run out food before you got money to buy?**
    ☐ No (Continue to Q21) ☐ Yes

20. How often did this happen?
    ☐ Rarely (only once to three times in 1-2 months)
    ☐ Sometimes (more than 4 times in some months but not every months)
    ☐ Often (Almost every months)

21. In the past 12 months, were you or any household member **not able to eat the kinds of foods you preferred because of a lack of resources**?
☐ No (Continue to Q23) ☐ Yes

22. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

23. In the past 12 months, did you or any household member **have to eat a limited variety of foods due to a lack of money**?
☐ No (Continue to Q25) ☐ Yes

24. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

25. In the past 12 months, did you ever **cut the size of the meal because there wasn`t enough money to buy so that there would be more food for the family until you get the money**?
☐ No (Continue to Q27) ☐ Yes

26. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

27. In the past 12 months, did you **ever not eat for a whole day because there wasn't enough money for food**?
☐ No (Continue to Q29) ☐ Yes

28. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

29. In the past 12 months, **did you or your family have to eat a fewer frequency of meal than usual because there was not enough food?**
☐ No (Continue to Q31) ☐ Yes

30. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

31. In the past 12 months, did you or any household member **go to sleep at night hungry because there was not enough food**?
☐ No (Continue to Q33) ☐ Yes

32. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

33. In the past 12 months, did you or any household member **have to eat same kind of food every day**?
☐ No (Continue to Q35) ☐ Yes

34. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

35. In the past 12 months, did you and your household **ever experience couldn't eat healthy and nutritious food** (balance diet- "4 sehat 5 sempurna")?
☐ No (Continue to Q37) ☐ Yes

36. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

37. In the past 12 months, did you **ever worry to balance the need of food for your family with other basic needs**?
☐ No (Skip Q38) ☐ Yes

38. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

PART II - Children

Instruction:
For those who have children under 15 years old, please fill the questions 39 - 50

51. In the last 12 months, did you **ever cut the size of your children meals because there wasn't enough money for food**?
☐ No (Continue to Q40) ☐ Yes

52. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

53. In the last 12 months, did you **ever relied on only a few kinds of low-variety of food to feed your child/ children because you are running out of food and money to buy better food**?
☐ No (Continue to Q43) ☐ Yes

54. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

55. In the last 12 months, **were your children not eating a balanced meal ("4 sehat- 5 sempurna"), because you couldn`t afford**?
☐ No (Continue to Q45) ☐ Yes

56. How often did this happen?

☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

57. In the last 12 months, **did your children complain of hunger due to lack of food in the household**?
☐ No (Continue to Q40) ☐ Yes

58. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

59. In the last 12 months, **did your children lose or increase weight rapidly**?
☐ No (Continue to Q40) ☐ Yes

60. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

61. In the last 12 months, **did you ever worry to balance the need of food for your children with other basic needs**?
☐ No (Continue to Q40) ☐ Yes

62. How often did this happen?
☐ Rarely (only once to three times in 1-2 months)
☐ Sometimes (more than 4 times in some months but not every months)
☐ Often (Almost every months)

PART III

Instruction:

On the scale below, please circle the number of each statement that best describes yourself and your feeling now

1. **How do you feel today**:

   Less Happy Very happy

   1 2 3 4 5 6 7

2. **In general, I consider myself**:

   Not typical happy person a very happy person

   1 2 3 4 5 6 7

3. **Compared to most of my peers, I consider myself**:

   Not typical happy person a very happy person

   1 2 3 4 5 6 7

4. **Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extend does this characterization describe you**

   Not at all a great deal

   1 2 3 4 5 6 7

Appendix B
Stata Result - Ordered logistic model results.

Logit Result Chapter 4

Ordered logistic regression — Number of obs = 150
LR chi2(10) = 69.61
Prob > chi2 = 0.0000
Log likelihood = -60.671474 — Pseudo R2 = 0.3645

figroup_2n	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	-.0281961	.4710225	-0.06	0.952	-.9513833	.894991
gender_n						
Female	.9370689	.5432511	1.72	0.085	-.1276838	2.001821
DR_n						
Tinggi	-1.663999	.4903886	-3.39	0.001	-2.625143	-.7028552
income__						
low	-2.071034	.5868964	-3.53	0.000	-3.221329	-.9207379
dwelling_n						
own	1.125786	.5190141	2.17	0.030	.1085366	2.143035
age_nnn						
20-29	-.5913071	1.010755	-0.59	0.559	-2.57235	1.389736
50-59	.3695825	.5946119	0.62	0.534	-.7958355	1.535
>= 60	-.9723833	.8366767	-1.16	0.245	-2.612239	.6674729
job_n						
full	1.161001	.4851419	2.39	0.017	.2101406	2.111862
migration_n_03						
Yes	-1.150916	.4933463	-2.33	0.020	-2.117857	-.1839746
/cut1	-1.687052	.8289886			-3.31184	-.0622647

Ordered logistic regression — Number of obs = 150
LR chi2(10) = 69.61
Prob > chi2 = 0.0000
Log likelihood = -60.671474 — Pseudo R2 = 0.3645

figroup_2n	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	.9721977	.457927	-0.06	0.952	.3862064	2.447314
gender_n						
Female	2.552489	1.386642	1.72	0.085	.8801317	7.402527
DR_n						
Tinggi	.1893801	.0928698	-3.39	0.001	.0724294	.4951695
income__						
low	.1260554	.0739815	-3.53	0.000	.039902	.3982251
dwelling_n						
own	3.082638	1.599932	2.17	0.030	1.114646	8.525269
age_nnn						
20-29	.5536032	.5595572	-0.59	0.559	.0763559	4.013791
50-59	1.44713	.8604809	0.62	0.534	.4512041	4.641328
>= 60	.3781806	.3164149	-1.16	0.245	.07337	1.949305
job_n						
full	3.193129	1.549121	2.39	0.017	1.233852	8.263614
migration_n_03						
Yes	.316347	.1560686	-2.33	0.020	.1202892	.8319569
/cut1	-1.687052	.8289886			-3.31184	-.0622647

Appendix C
Econometric Model of Chapter 5

An econometric model for section 5.1:

The econometric model for model I is written as follows:

$$\ln\left(\frac{\sum_{j=1}^{k} p_j}{1-\sum_{j=1}^{k} p_j}\right) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 age_2 + \beta_4\ age_3 + \beta_5 income + \beta_6 migration + \beta_7 employment + \beta_8 education + \beta_9 housing + \beta_{10} dependency\_ratio$$

The econometric model for model 2 is written as follows:

$$\ln\left(\frac{\sum_{j=1}^{k} p_j}{1-\sum_{j=1}^{k} p_j}\right) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 age_2 + \beta_4\ age_3 + \beta_5 income + \beta_6 migration + \beta_7\ employment + \beta_8\ education + \beta_9\ housing + \beta_{10}\ dependency\_ratio\ \beta_{11} food\_insecurity$$

Where j = 1,2, …, k (k = number of category of dependent variable)

To interpret model 1 and 2, the study employed the marginal effect.
The marginal effect is the change in the probability value of the dependent variables when the independent variable changes, assuming the other variables are fixed. In the logit model, the marginal effect of Xj is written as follows:

$$\frac{\partial_{\pi(x_1)}}{\partial x_j} = \pi(x_1)\ .\ (1 - \pi(x_i).\ \beta_j$$

Where βj is the coefficient of independent variables j

An econometric model for section 5.2

The econometric model for model 3 is written as follows:

$$\ln\left(\frac{\sum_{j=1}^{k} p_j}{1-\sum_{j=1}^{k} p_j}\right) = \beta_0 + \beta_1 gender + \beta_2 age + \beta_3 age_2 + \beta_4\ age_3 + \beta_5 income + \beta_6 migration + \beta_7\ employment + \beta_8\ education + \beta_9\ housing + \beta_{10}\ dependency\_ratio + \beta_{11}\ food\_insecurity + \beta_{12}\ gender\ migration + \beta_{13}\ age\ migration + \beta_{14}\ age_2\ migration + \beta_{15}\ age_3\ migration + \beta_{16}\ income\ migration + \beta_{17}\ employment\ migration + \beta_{18}\ education\ migration + \beta_{19}\ housing\ migration + \beta_{20}\ dependency\_ratio\ migration + \beta_{21}\ food\_insecurity\ migration$$

Where j = 1,2, …, k (k = number of categories of dependent variable)

Appendix D
Stata Result - Ordered logistic model results chapter 5

Logit Result Section 5.5.1

Ordered logistic regression — Number of obs = 150
LR chi2(10) = 28.48
Prob > chi2 = 0.0015
Log likelihood = -149.07043 — Pseudo R2 = 0.0872

happiness_n	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	.1154857	.3252014	0.36	0.722	-.5218973	.7528687
gender_n						
Female	-.0971146	.3961193	-0.25	0.806	-.8734941	.6792649
DR_n						
Tinggi	-.7395268	.350413	-2.11	0.035	-1.426324	-.05273
INCOME__						
else	-.289212	.3409601	-0.85	0.396	-.9574816	.3790576
dwelling_n						
own	1.136675	.3487948	3.26	0.001	.4530499	1.8203
age_nnn						
20-29	-.0450214	.707233	-0.06	0.949	-1.431173	1.34113
50-59	.1349266	.4147785	0.33	0.745	-.6780243	.9478775
>= 60	-.0488046	.5452975	-0.09	0.929	-1.117568	1.019959
job_n						
full	.6378208	.3652398	1.75	0.081	-.0780359	1.353678
migration_n						
Yes	.630823	.3303622	1.91	0.056	-.016675	1.278321
/cut1	.4278375	.5638035			-.6771971	1.532872
/cut2	1.849245	.5840655			.7044974	2.993992

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Ordered logistic regression — Number of obs = 150
LR chi2(10) = 28.48
Prob > chi2 = 0.0015
Log likelihood = -149.07043 — Pseudo R2 = 0.0872

happiness_n	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	1.122418	.365012	0.36	0.722	.5933936	2.123082
gender_n						
Female	.907452	.3594592	-0.25	0.806	.4174902	1.972427
DR_n						
Tinggi	.4773397	.167266	-2.11	0.035	.2401903	.9486361
INCOME__						
else	.7488534	.2553292	-0.85	0.396	.3838584	1.460907
dwelling_n						
own	3.11639	1.086981	3.26	0.001	1.573103	6.173713
age_nnn						
20-29	.955977	.6760985	-0.06	0.949	.2390284	3.823361
50-59	1.144453	.4746944	0.33	0.745	.5076189	2.580227
>= 60	.9523672	.5193235	-0.09	0.929	.3270743	2.773081
job_n						
full	1.892353	.6911624	1.75	0.081	.9249312	3.871638
migration_n						
Yes	1.879156	.6208022	1.91	0.056	.9834633	3.590606
/cut1	.4278375	.5638035			-.6771971	1.532872
/cut2	1.849245	.5840655			.7044974	2.993992

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Ordered logistic regression — Number of obs = 150
LR chi2(11) = 60.63
Prob > chi2 = 0.0000
Log likelihood = -132.99692 — Pseudo R2 = 0.1856

happiness_n	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	.190504	.3460852	0.55	0.582	-.4878107	.8688186
gender_n						
Female	-.3729756	.4244301	-0.88	0.380	-1.204843	.4588921
DR_n						
Tinggi	-.1661604	.3861944	-0.43	0.667	-.9230874	.5907667
figroup_2n						
insecure	-2.469463	.4673408	-5.28	0.000	-3.385434	-1.553492
INCOME__						
else	-.8049803	.3734049	-2.16	0.031	-1.53684	-.0731201
dwelling_n						
own	.7411116	.3724609	1.99	0.047	.0111017	1.471122
age_nnn						
20-29	.2484296	.7683813	0.32	0.746	-1.25757	1.754429
50-59	.0052134	.4261828	0.01	0.990	-.8300894	.8405163
>= 60	.3922106	.587535	0.67	0.504	-.7593368	1.543758
job_n						
full	.2820323	.3916643	0.72	0.471	-.4856156	1.04968
migration_n						
Yes	.644062	.3485595	1.85	0.065	-.039102	1.327226
/cut1	-1.029826	.6460163			-2.295995	.2363427
/cut2	.6724726	.6369499			-.5759263	1.920871

Ordered logistic regression — Number of obs = 150
LR chi2(11) = 60.63
Prob > chi2 = 0.0000
Log likelihood = -132.99692 — Pseudo R2 = 0.1856

happiness_n	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	1.209859	.4187144	0.55	0.582	.6139691	2.384093
gender_n						
Female	.688682	.2922974	-0.88	0.380	.299739	1.58232
DR_n						
Tinggi	.8469104	.327072	-0.43	0.667	.3972905	1.805372
figroup_2n						
insecure	.0846303	.0395512	-5.28	0.000	.0338629	.211508
INCOME__						
else	.4470968	.1669481	-2.16	0.031	.2150595	.9294892
dwelling_n						
own	2.098267	.7815223	1.99	0.047	1.011164	4.354116
age_nnn						
20-29	1.282011	.985073	0.32	0.746	.2843441	5.780148
50-59	1.005227	.4284105	0.01	0.990	.4360103	2.317563
>= 60	1.480249	.8696983	0.67	0.504	.4679767	4.682152
job_n						
full	1.325822	.5192769	0.72	0.471	.6153183	2.856737
migration_n						
Yes	1.9042	.663727	1.85	0.065	.9616527	3.770569
/cut1	-1.029826	.6460163			-2.295995	.2363427
/cut2	.6724726	.6369499			-.5759263	1.920871

Logit Result Section 5.5.2

Ordered logistic regression — Number of obs = 150
LR chi2(21) = 82.43
Prob > chi2 = 0.0000
Log likelihood = -122.09712 — Pseudo R2 = 0.2524

happiness_n	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
educ_n						
high	-.2383322	.4706077	-0.51	0.613	-1.160706	.684042
gender_n						
Female	-.3429619	.542064	-0.63	0.527	-1.405388	.7194639
DR_n						
Tinggi	.3888146	.5258955	0.74	0.460	-.6419216	1.419551
figroup_2n						
Food Secure	2.023376	.6735133	3.00	0.003	.7033138	3.343438
INCOME__						
else	-1.169908	.5455931	-2.14	0.032	-2.23925	-.1005648
dwelling_n						
own	.9643163	.5376115	1.79	0.073	-.0893828	2.018015
age_nnn						
20-29	-1.632401	1.401706	-1.16	0.244	-4.379694	1.114891
50-59	-.0918313	.5667572	-0.16	0.871	-1.202655	1.018992
>= 60	-.1881724	.7426821	-0.25	0.800	-1.643803	1.267458
job_n						
full	.2892047	.5272839	0.55	0.583	-.7442526	1.322662
migration_n						
Yes	-.8260113	1.349247	-0.61	0.540	-3.470487	1.818464
migration_n#age_nnn						
Yes#20-29	2.937081	1.832455	1.60	0.109	-.6544649	6.528626
Yes#50-59	-.1007796	.9342584	-0.11	0.914	-1.931892	1.730333
Yes#>= 60	2.274119	1.435421	1.58	0.113	-.5392536	5.087492
migration_n#gender_n						
Yes#Female	-1.102648	.9620214	-1.15	0.252	-2.988175	.7828793
migration_n#educ_n						
Yes#high	1.558452	.7993176	1.95	0.051	-.0081823	3.125085
migration_n#figroup_2n						
Yes#Food Secure	2.439992	1.122834	2.17	0.030	.2392769	4.640706
migration_n#INCOME__						
Yes#else	.1766545	.8226044	0.21	0.830	-1.435621	1.78893
migration_n#DR_n						
Yes#Tinggi	-1.825628	.8711542	-2.10	0.036	-3.533059	-.1181967
migration_n#dwelling_n						
Yes#own	.0783814	.816674	0.10	0.924	-1.52227	1.679033
migration_n#job_n						
Yes#full	.040985	.8458687	0.05	0.961	-1.616887	1.698857
/cut1	.9281599	.7542819			-.5502055	2.406525
/cut2	2.81533	.7937885			1.259533	4.371127