Socioeconomic Status and Accessibility to Public Healthcare Facilities: A Case Study of Cilegon, Indonesia.

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DECEMBER, 2015

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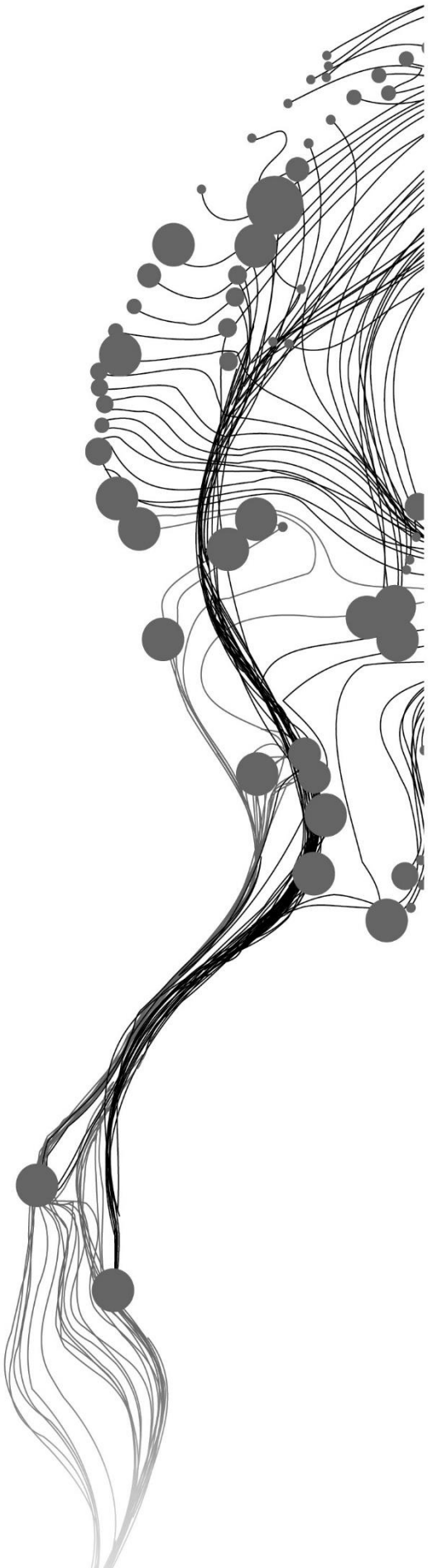

Socioeconomic Status and Accessibility to Public Healthcare Facilities: A Case Study of Cilegon, Indonesia.

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Enschede, The Netherlands, December, 2015

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ABSTRACT

Socioeconomic status (SES) may influence the health status of an individual or community. The attention given to SES as a predictor of health status keep growing since 1960. Meanwhile, equal access to health facilities support individuals and the communities to reach better health status. This research seeks the spatial distribution of socioeconomic groups with respect to SES categorization established by the government of Indonesia. Afterwards, this study aims to understand the current accessibility of public health facilities across SES groups in the city of Cilegon, Indonesia.

Research began with reviewing literature on underlying concept related to SES which include the indicators and measurements used by previous studies, as well as how concept and measurement of SES implemented in the case of Indonesia. The research focused on exploring the available dataset regarding SES of the population in Cilegon. Descriptive statistics was carried out to analyze the characteritics of SES groups within the city, result shows that not all of variables listed in dataset could be a good indicator to determined socioeconomic position of the population. It is also found that the poorest population are mostly distributed in the outskirts if the city, meanwhile, as the SES gets higher the population tend to live closer to the city center.

Other than that, the conceptualization and component of accessibility also be reviewed in order to select the most suitable analytical methods for this research. The location-based perspective using cumulative opportunities measure was chosen after. It is used to identify the availability of public health service for the population and highlight the service coverage of public health facilities. The result shows a variation of the level of accessivility occurred across SES groups, the poorest population earned the worst access and the non-poor being the most advantaged by the health service. Although this research conducted with the limited access of data, this research could provide some evidence regarding the implementation of current SES stratification system and the condition of accessibility to public health facilities in the case of Cilegon, Indonesia.

Keywords: socioeconomic status, stratification, accessibility, cumulative opportunities, public health facilities, Indonesia

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GLOSSARY

SES: Socioeconomic Status
DHS: Demographic and Health Survey
PPLS: Data Collection for Social Protection Programme
BPS: Statistics Bureau of Indonesia
TNP2K: National Team for Poverty Eradication
PMT: Proxy Means Test
RW: Administrative unit in Cilegon, one level below village.
RT: Smallest administrative unit in Cilegon, one level below RW. Unit analysis of this research.
PHC: Primary health center

1. INTRODUCTION

1.1. Background

Various factors influence the health status of an individual, one of them is socioeconomic condition. It is well-recognized to be an important determinant of both the health status of individuals and the community (Goodridge, Hawranik, Duncan, & Turner, 2012). Growing attention in disease and health is often given to socioeconomic status (SES), moreover, the amount of research that has brought SES topics into health domain has dramatically increased since 1960 (Oakes & Rossi, 2003). Nowadays, many researchers are using SES as a predictor of health status. For example, it is explained that higher level of SES would be associated with positive health behavior and a better health status (Nguyen, Moser, & Chou, 2014) and studies have found that lower socioeconomic position is strongly related to poorer health (Blakely, Hales, & Woodward, 2004)

SES in general can be described as "the position of individuals, families, households, or other aggregates in one or more dimensions of stratification" (Bollen, Glanville, & Stecklov, 2001, page 157). Most of the social sciences and social epidemiology literature defines SES as a broad construct which is ideally measured using several socioeconomic factors such as economic resources, power, and prestige (Braveman, Cubbin, Egerter, Marchi, & Metzler, 2013). Monetary information such as income and expenditure (consumption) often preferred as the indicators, however the assessment of economic condition of SES is frequently hindered by the difficulties in collecting accurate income/expenditure information (Montgomery, Gragnolati, Burke, & Paredes, 2000). An experiment done by Gwatkin et al. (2007) shows that household survey data sets which contain information about household characteristics and possessions generally produced the same results as consumption or expenditure based measures when determining socioeconomic groups, thus these indicators are a generally acceptable and reliable proxy for SES. An ongoing programme that has detailed information regarding household charateristics, such as housing features and possession of durable goods, is the Demographic and Health Survey (DHS) programme which conducted in approximately 75 countries, including Indonesia.

The current condition of SES in Cilegon is illustrated in Figure 1.1. Four categories of deprived groups, which represents the population with the lowest welfare status were established using the variables related to housing features, assets, as well as the demographic characteristics of household member: very poor, poor, moderately poor and vulnerable. Very poor is the lowest ranking and it consists of households with the lowest per capita expenditure while the vulnerable consist of the least deprived households with higher per capita expenditure. The proportion between these four groups within the city is not very significant with 13% out of total population are considered as having the lowest welfare status. It can also be identified from the chart that 87% of Cilegon population is regarded as having better condition compared to deprived population and classified as non-deprived group. This study emphasizes on the identification of socioeconomic position within population of Cilegon city by exploring the existing dataset collected by the Statistics Bureau of Indonesia (BPS).

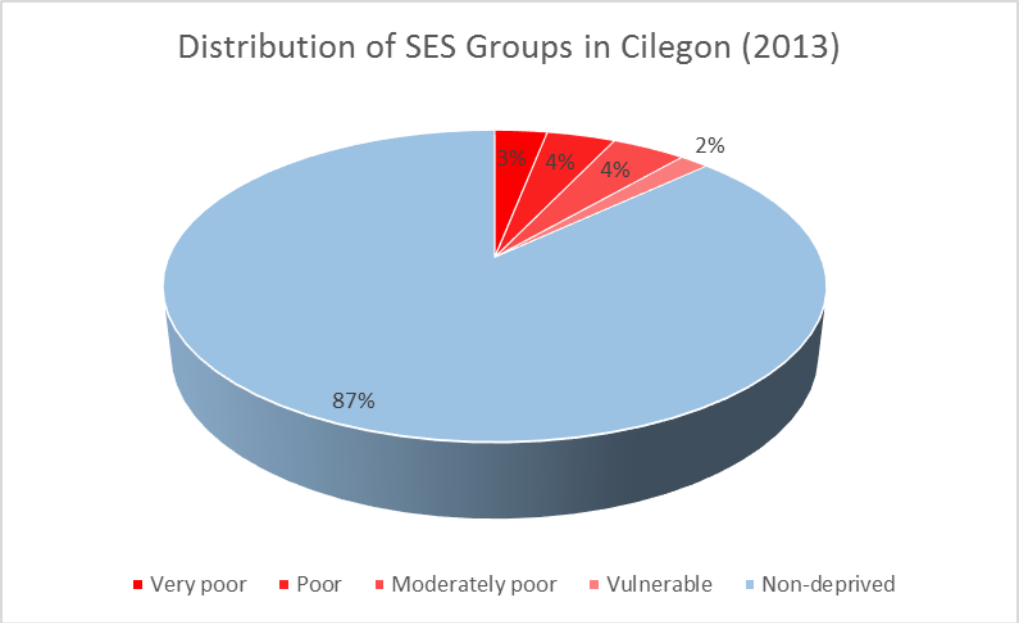

Figure 1.1. Distribution of SES groups in Cilegon
Source: BPS (2013)

Equal access to health facilities support individuals and the community to achieve better health status (WHO, 2010). Access in health studies is a multi-dimensional concept consisting several factors that include availability, acceptability, affordability, adequacy and accessibility (Shrestha, 2010). This research highlights the limited accessibility to health facilities which became an important factor that contributes to the poor health status of populations. Improving spatial accessibility and equal distribution of health services units in a region will make it easier for the people in preventing and dealing with disease and mortality risk. Related to SES, Heck & Parker (2002) found that family in low SES groups are probably most vulnerable to problems of health care access.

The use of the Geographic Information System (GIS) as a planning support system has become a popular technique in public health domain. It has an important role in facilitating the spatial linking of diverse health, social, and environmental datasets (McLafferty, 2003). There has been abundant examples of GIS application in analyzing the accessibility to health facilities, the result provides an essential spatial information to conduct further judgement such as where the further interventions with great impact can take place to improve accessibility (Song, Zhu, Mao, Li, & An, 2013; Rosero-Bixby, 2004). This research seeks the spatial distribution of SES groups as defined by existing classification established in Indonesia. Afterwards, by treating SES as an explanatory variable, this study aims to understand the current accessibility of public health facilities in the city of Cilegon, Indonesia.

1.2. Problem Statement

In Indonesia, BPS collected specific set of data particularly for identifying poor population called *Pendataan Program Perlindungan Sosial* (PPLS). Historically, PPLS was carried out to identify poor households that eligible the financial assistance programme which is established by the central government in 2005 and to date PPLS data collection has become a continuous survey carried out every three years with the main purpose to provide comprehensive database of 40% population with the lowest welfare status, also known as deprived groups. PPLS dataset consist of proxy variables to predict per capita expenditure such as housing features, possessions of durable goods and demographic characteristics. The result of per capita expenditure

prediction is then divided into four categories of deprived population with a gradual quantitative difference, which are very poor, poor, moderately poor and vulnerable (Ministry of Social Service and BPS, 2011).

This study is aimed to explore the PPLS dataset in order to get a better view of how the SES groups distributed within the city. Furthermore, apart from the spatial explanation regarding SES groups concentration, there are two issues that needs to be considered regarding the SES categorization when it comes to the implementation as an input for selecting the social protection programme beneficiaries. First issue can be attributed to the question about what are the indicators that can be a good representative to explain the condition in each deprived category. Second is to what extent SES categorization is systematic and it means there should be a gradual quantitative difference between each category as suggested by the result from per capita expenditure prediction. Hence, there is an importance to conduct an investigation to PPLS dataset that can explain the two issues regarding the current SES measurement in Indonesia before going into further analysis.

Meanwhile accessibility has also become a concern to policy makers, public health reformers and practitioners since recent years because it has brought convincing evidence about spatial barriers between consumer and provider that may contribute to lower health care utilization which then lead to decreasing in health status (Neutens, 2015). Variation in public health services provision can be expected as a consequence of the socioeconomic heterogeneity then by conducting the most suitable accessibility measure will assist in highlighting which group that need more attention. Therefore, understanding the relationship between SES and accessibility it can provide an evidence regarding SES in Cilegon and service coverage of public health facilities as a first step towards government intervention related to health status.

1.3. Research Objective

This research aim to examine the relationship between socioeconomic status and accessibility to public health facilities. The main objective is divided into three specific objectives as follows:

1) To identify spatial variation and the characteristics of SES groups in Cilegon
2) To assess if levels of accessibility to public health care facilities varies across SES groups.
3) To analyze whether the existing condition of accessibility to public health facilities is already in accordance with the current health policies.

1.4. Research Questions

Several questions are raised to answer each of the specific objectives:

Questions for specific objective 1:

1) How can SES best be defined?
2) What are indicators that can be used to measure SES?
3) Do different groups of deprived population have distinct characteristics?
4) How is the spatial variation in Cilegon for each SES category?

Questions for specific objective 2:

1) Given the available data, what is the most suitable accessibility method to identify variation in the level of accessibility to public health facilities?
2) How does the level of accessibility vary across SES groups?

Questions for specific objective 3:

1) What are the current health policies in Cilegon?
2) Does the existing condition of accessibility is relevant to the current health policies?

1.5. Conceptual Framework

The conceptual framework in Figure 1.2 presents the general idea of this research. There are two main concept underlies this research. To start with, this study will be focused on SES indicators that contribute to generate the deprived categories in Indonesia. Three main indicators were identified according to BPS which are housing features, assets and demographic characteristics of household member. Number of variables that construct these three key indicators are calculated in order to obtain four categories of deprived population in household level using the existing methods implemented in Indonesia. Furthermore, the result given will be examined further to identify the characteristics of SES groups existed in the city of Cilegon, focusing on the deprived groups because the limited information provided by PPLS dataset. Population that do not included in the deprived groups will be regarded as a non-deprived group. Then, the same SES dataset is going to be used to explain the deprived groups spatial distribution within the city of Cilegon including the non-deprived group.

On the other hand, the research also aims to measure the accessibility to public health facilities. SES is relevant to be included in this analysis since the level of accessibility may differ depend on the socioeconomic condition of the population. By using the an appropriate accessibility measure to determine the service area, the number of facilities available in predefined criteria as well as the variation of the accessibility level across SES groups can be described. A policy context, particularly on the existing minimum service standards for public health facilities, will be involved because it has an influence to the accessibility assessment in this research and it also play a role as a benchmark to determine the quality of public health facilities in providing services to the population. Therefore, this research is intended to check the current health policies and compare it with the finding from the accessibility level across SES groups to further examine the quality of accessibility.

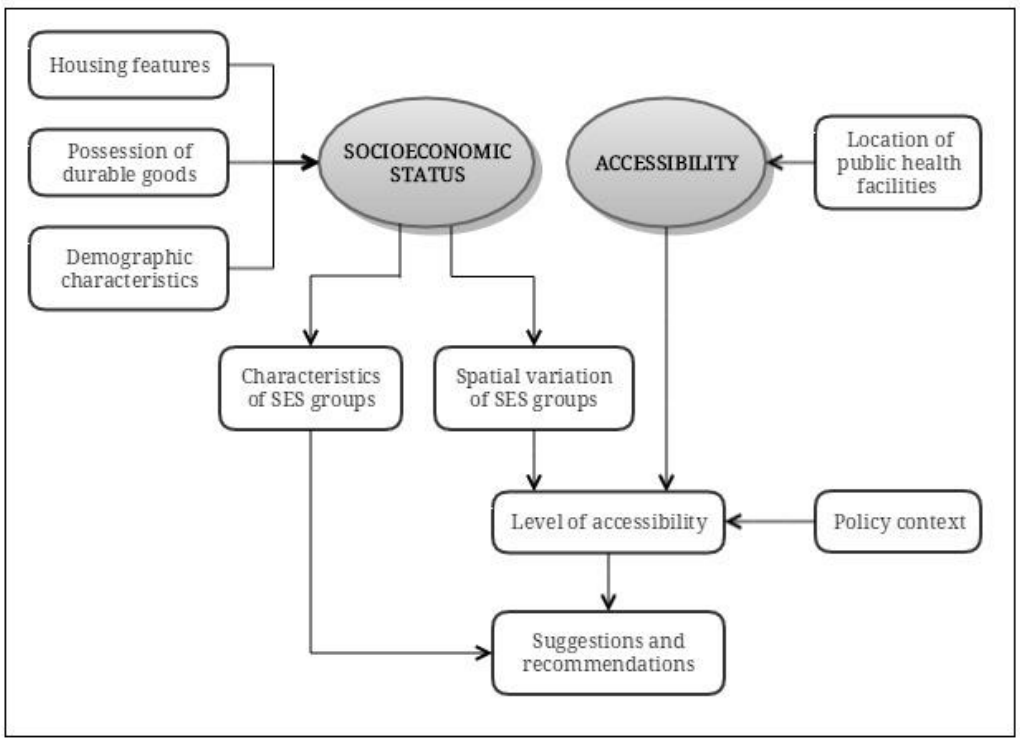

Figure 1.2. Conceptual framework

1.6. General Approach

Research will begin with reviewing the relevant literatures on the underlying concept of SES which include the indicators and measurements used by previous studies as well as how concept and measurement of SES implemented in the case of Indonesia. Other than that, the concept of accessibility also be reviewed in order to justify the choice of appropriate analytical methods for this study. The in-depth explanation of Cilegon as the study area is provided in the second phase. Afterwards, third phase of the research focused on exploring the given dataset regarding socioeconomic condition of the population to identify the distribution and the characteritics of socioeconomic groups within the city followed by measuring the level of accessibility to public healthcare facilities to highlight the condition of service coverage. Table 4.1. summarizes the main tasks involved for the overall analysis according to the proposed research questions.

Table 1.1. Research task

Specific Objectives	Research Questions	Tasks	Analytical Methods	Required Data
1	How can SES best be defined?	Understanding SES concept in general and its difference with social class	Literature review	Literature
	What are indicators that can be used to measure SES?	- Synthetizing SES indicators and measures used in previous study - Explaining SES measures application in the case of Indonesia	Literature review	Literature
	Do different groups of deprived population have distinct characteristics?	Socioeconomic characteristics identification fot the deprived groups	Statistical analysis	- SES variables (database file)
	How is the spatial variation in Cilegon for each SES category?	Identifying spatial variation of all socioeconomic groups	Visualization on ArcMap	- Administrative boundary (shapefile) - SES variables (database file)
2	Given the available data, what is the most suitable accessibility method to identify variation in the level of accessibility to public health facilities?	- Overview of accessibility concept in general as well as in the health domain - Selecting the most appropriate methods to support the analysis	Literature review	Literature

	How does the level of accessibility vary across SES groups?	- Creating service area map for each health facilties - Identifying level of accessibility for each SES groups	Accessibility measure using ArcMap	Literature
3	What are the current health policies in Cilegon?	Studying the current health policies, particularly on minimum service standards for health facilities, in Indonesia	Literature review	Relevant documents from several institutions
	Does the existing condition of accessibility is relevant to the current health policies?	Policy check	Descriptive analysis	Finding from SES and accessibility analysis

1.7. Structure of the Report

Chapter 1 – Introduction
This chapter introduces the general idea of the research. Started from a brief motivation of the research, problem statement, main objective, then followed by specific objectives, research questions and lastly the conceptual framework.
Chapter 2 – Literature Review
This chapter provides a review of previous research regarding definitions and concepts of SES and accessibility which are going to support the analysis process. Review on how SES measurement is implemented in Indonesia will also be reviewed in this chapter.
Chapter 3 –Study Area
This chapter presents a general description of the physical, demographic and socioeconomic condition in the city of Cilegon. In addition, an overview of how the health system is organized in Indonesia as well as the policies that related to utilization of healthcare facilities is discussed briefly.
Chapter 4 – Methodology
This chapter describes the methodology to be conducted in this research. Detailed information regarding the unit of analysis, data collection, general approach in carrying out the research and other information such as quality of the dataset are provided. The two main analytical methods in order to answer the research questions are described in this chapter.
Chapter 5 – Results and Discussion
This chapter explains the finding of analysis that is performed using the chosen techniques. The analysis regarding SES stratification, spatial variation of SES in Cilegon and the level accessibility to public health facilities across SES groups are presented. Discussion section contains reflection of the research in addressing all research questions.
Chapter 6 – Conclusion and Recommendations
This chapter will summarizes the main findings of the research and it organizes based on the main objective. The strength and limitations of the methodology as well as the further recommendations will be included to improve the research.

2. LITERATURE REVIEW

This chapter comprises the review on the definition and concept of the two main elements of the research. The first section provides the general concept of socioeconomic status, gives the overview of socioeconomic status indicators and its measurement based on previous studies, also the review of implementation of SES measurement in Indonesia. Furthermore, the concept and measurement of accessibility will be explained in the second section.

2.1. Socioeconomic Status

Socioeconomic status (SES) is one of the two main concept underlying this research. In this section, the conceptualization of how SES differ from social class is discussed. This is important because it is related to the reason of why SES is more suitable to use as a main concept as well as the terminology in this research instead of social class. To continue, the indicators of the SES that has been used by previous research is explained. Furthermore, the implementation of SES in Indonesia is describe in the last section to provide a knowledge of how four categories of deprived population were established.

2.1.1. Definition and Concept

Sociological studies often use SES as a factor to predict human behavior. The widening gap between the low and high SES contributes to economic segregation among regions and/ or neighborhoods has an impact on public service provision. Measures of SES often serve as inputs to another analysis, such as inequality or poverty analysis which consider SES as a dependent variable. For example, to explain the household health status or economic behavior, SES can be used as an input. There are many approaches taken in defining SES due to lack of a single theory that has a monopoly on the meaning of it. Generally, SES can be defined as "The position of individuals, families, households, or other aggregates on one or more dimensions of stratification. These dimensions include income, education, prestige, wealth, or other aspects of standing that member of society deem salient." (Bollen et al., 2001, page 157). Oftenly, SES and social class are ambiguous terms which refer to social and economic characteristics of the population. According to the research from Wohlfarth (1997) regarding the socioeconomic inequality measurement in health studies, there are two important ways in which the SES concept differs from the social class. First, social class focuses on control as the basis of social and economic inequality, whereas the SES stresses on prestige or the social position. Second is that social classes are constructed from well defined entities and qualitatively different from each other, whereas SES is defined in terms of gradations where there is a gradual quantitative difference between strata. Because quantitative data is more readily available from routinely collected data, that is why, although SES is easier to measure, the potential result of analysis might be different with social class measurement.

Social classs conceptualization is based on Karl Marx's work in 1894 which is based on the notion of exploitation. To shape the criteria for the definition of social class, the measurement should extract deeper information regarding the employment status to represent the control over production: ownership of the physical means of production, control over investments, control over labor power and control over one's work (Wright & Shin, 1988). With these criteria, Wright and Shin were able to demonstrate that the social class definition explained variance in income that could not be explained by SES. One of the examples of social class measurement was carried out by Wolhlfarth (1997) who divided the employment status into two big categories, self-employed and employees. The first category is broke down into three classes according to the number of employees. They are *petty bourgeoisie* which is defined as having zero or no employees, *small employers* with 10 or less employees and the *bourgeoisie* which is having more than 10 employees. The second

category is divided into five classes based on control over budget. If people have the influence in budget decision, they are classified as *managers* or *decision makers* depending on the authority over the other workers. On contrary, when people do not have control over budget they are classified as *supervisors*, *semiautonomous employees* and *workers*. The difference between these three is that the function of supervisors involved authority while the rest are defined as having no control over other workers. To compare, the study then used education level and occupation as the SES indicators. At the end, the study concluded that conceptualizing social inequality as social class may improve the reader's understanding of various issues in community health problem especially in the case of psychiatry. Wohlfarth (1997) also shows that the term social class and socioeconomic status are neither theoretically nor empirically interchangeable.

On the other hand, some researchers stated that both social class and SES terms can be used interchangeably (Wyatt-Nichol, Brown, & Haynes, 2011). There are two approaches to conceptualize social class which are structural and processual approaches. First approach depicts class as "a matrix of field categories in which individuals move up or down a continuum" while the other approach interprets class as "group identities shaped by common, shared experiences". Structural approaches see social class from the way it determines the material interest of individual actors and by creating various resources the actors can generally use to achieve those material interests. This approach of class analysis can be measured through common SES indicators such as income, occupation and education. Bollen et al. (2001) stated although the definition of both SES and social class are vague, however, both could serve as "shorthand expressions" to refer to social and economic characteristics that are considered to be important in a particular phenomena.

Based on the above discussion, a thin gap was found between social class and SES conceptualization. Previous research were able to prove that social class concept could explain variance in income that could not be explained by SES as there is often a problem in employing income as an indicator of SES which is mainly because the richness of information collected in the survey. A good example is the case of multiple income sources from different type of employment. Hence, the term SES is more suitable for this research because the dataset that will be explored later does not provide information on employment status that can form the indicator for social class. This means that secondary data obtained cannot be used to gain the knowledge for social class.

2.1.2. Socioeconomic Status Indicators

Generally SES can be measured by using monetary information such as income and consumption expenditure. However, Montgomery et al. (2000) stated that in developing countries, it is difficult to use income as an indicator because households often draw their incomes from multiple sources that may change over the time. In consequence, data collection requires attention to the details of primary and secondary job, self or temporary employment and the nature of the payment. Gupta (1997) used land ownership as a sole indicator in measuring SES differences because data on average income is less accurate than landholdings. Information regarding consumption and expenditure is easier to measure, especially in rural settings, but then again extensive data collection needs to be conducted which is time-consuming and more costly (Filmer & Pritchett, 2001). Gwatkin et al. (2007) added, the issue that often occurred in data collection of income is people often fail to keep track of their consumption or expenditures. Moreover, in developing countries, many of these leads to difficulties in transforming transactions that do not involve cash into certain value.

To overcome the absence of income, consumption and expenditure information, measures of household ownership of durable goods and housing quality are frequently employed to determine household economic status, as they are easier to collect than either income or expenditure data (Kolenikov & Angeles, 2009).

Asset and properties owned by a household can be also a good indicator of individual 'long-run' economic status (Houweling, Kunst, & Mackenbach, 2003). The advantage of using asset indicators is the information on the quality of particular asset is less seasonal unlike the income that sourced from self-employed or agricultural worker (McKenzie, 2005). Moreover, the time required to gather data on asset variables are likely to be shorter than data for consumption or income, allowing surveys to collect more information on other issues of interest such as health condition and educational attainment.

From 2001 onwards the World Bank started the wealth index as a reliable proxy to measure the relative economic position of the households. It is done by utilizing dataset from household survey such as DHS programme. Two major categories of SES indicators were included in the dataset which are housing features and possession of durable goods. As of 2007, DHS program covered more than 170 surveys in approximately 75 countries across Africa, Asia, Latin America, the Middle East, and the former Soviet Union. Information provided by DHS encompasses at least 25-30 (and often more) questions about housing features and possessions: materials used for house floors, walls, and roofs; source of water like a stream, open well, or piped system; and presence of durable possessions like a fan, television set, radio receiver, watch, bicycle, or automobile; and other attributes related to economic status along with detailed demographic information (Gwatkin et al., 2007). Table 2.1. presents an overview of SES indicators used by different researchers.

Education level is the most frequent variable used in SES measurement. Meanwhile, income somehow cannot stand alone as a predictor of SES probably because its weakness in providing the accurate and reliable information. Thus, researchers often include more variables to support the analysis. Education level and occupation of an individual are believed to have strong relationships with income. A study done by Su (2013) also shows that education and occupation are essential determinants of household's income. Furthermore, it can be seen from the table that the large number of research, particularly in health studies, used data from DHS surveys. The indicators used are assets, access to infrastructure (e.g. sanitation facility and source of water), and housing features (e.g. number of rooms for sleeping and building material) in measuring SES in household level. Other than that, information from the secondary data such as national health survey and other government survey can be used when mainly focused on individual level.

In addition, SES is not only a function of material capital (income, tangible asset, and property) and human capital (education level, skills, abilities), but also should include the social capital. This new perspective about social capital is to be said "has been empirically shown to have many positive impacts on individuals and aggregates" (Oakes & Rossi, 2003, page 177). For instance, social capital can be reflected by access to information and community involevement such as club membership. Report from Australian Government (2009) also included community involvement as one of four dimensions of socioeconomic status beside education, occupation, and economic resources. However, information regarding social capital is rarely treated as part of SES indicators, out of 15 studies included in Table 2.1, only Oakes and Rossi (2003) included social capital as an indicator. It indicates that to obtain information on social capital, a primary data collection must be conducted to gather information that can fully represent the condition of community involvement in individual or household level as this matters usually not a priority of government in data collecting data.

Table 2.1. SES indicators and measurement used in previous research

Data source	Author	Study domain	Indicators						Aggregation level		Analytical methods
			Income	Employment	Education	Housing features	Household assets	Community involvement	Individual	Household	
Demographic and Health Survey (DHS) programme	Montgomery et al. (2000)	Living standards				√	√			√	Linear regression
	Filmer and Pritchett (2001)	Education				√	√			√	PCA
	Houweling et al. (2003)	Health				√	√			√	PCA
	McKenzie (2005)	Education				√	√			√	PCA
	Vyas and Kumaranayake (2006)	Social statistics				√	√			√	PCA and cluster analysis
	Gwatkin et al. (2007)	Health				√	√			√	PCA
	Kolenikov and Angeles (2009)	Social statistics				√	√			√	PCA
National health survey and other government survey	Yabroff and Gordis (2003)	Health	√	√	√				√		Linear regression
	Lahelma et al. (2006)	Health		√					√		Correlation analysis
	Fukuda et al. (2007)	Health	√	√	√	√					PCA
	Talaei et al. (2013)	Health	√	√	√				√		Cluster analysis
Primary data/ independent survey for research purpose	Oakes and Rossi (2003)	Health	√		√		√	√	√	√	Correlation analysis and linear regression
	Wilson et al. (2004)	Health	√		√				√	√	Cluster analysis
	Amer (2007)	Health	√		√	√	√			√	Cluster analysis
	Shrestha (2010)	Health	√		√	√	√			√	Cluster analysis
	Kelaher et al. (2008)	Health		√	√	√	√		√		Logistic regression

As for the analytical method, some of researchers performed the Principal Component Analysis (PCA). To utilize the only data obtained from household survey such as DHS, the asset information would be treated as the basis for the creation of a wealth index. To give weighting in each of the items in DHS, a method such as PCA could be performed. A study from McKenzie (2005) adopt PCA approach with DHS data to construct an index that provide reasonable estimation of wealth level to indicate the inequality of educational attainment accross countries. Other than that, PCA has been the standard technique that uses non-monetary variables which are mostly qualitative ordinal indicators to measure SES (World Bank, 2001).

In the case of having other variables beside housing features and household possession such as income, occupation, education or possibly the community involvement, the indicators chosen can be directly treated as an independent variable for multivariate (linear or logistic regression) analysis. Kelaher, Paul, Lambert, Ahmad, & Smith (2008) conducted a study to see whether the socioeconomic position of an individual affects the relationship between ethnicity and health status. The result show differences between ethnicity and health status tended to be more accentuated in models which included SES indicators rather than models that did not take SES indicators into account. Beside multivariate analysis, correlation analysis is also used to identify the relations among the indicators (Lahelma, Laaksonen, Martikainen, Rahkonen, & Sarlio-Lähteenkorva, 2006). In the study from Lahelma et al. (2006), this approach is done to choose the highest correlation between indicators prior to perform the logistic regression, and result show that the high pairwise correlations were found between education level and occupation class.

The last method identified in the overview table is the cluster analysis. The purpose of cluster analysis to arrange objects into relatively homogeneous groups or clusters based on multivariate observations (Gore, 2000). In SES case, this procedure could be used to identify homogeneous subgroups of indicators chosen in a population. Amer (2007) and Shrestha (2010) used cluster analysis to stratify population into several strata such as of 'lower', 'middle' and 'higher' socioeconomic class. It is proved that this approach was able to organize different attributes of household characteristics based on similarities and dissimilatities within and between clusters, making each clusters has distinct characteristics that represents the condition of population belong to a particular group.

Overall, it can be identified that variables which are suitable for SES measurement are somehow rely upon the supporting data like Bollen et al. (2001) stated in their study "... it is clear that data availability influences the ways in which SES can be measured". Table 2.1 shows when the research is carried out by using primary data then the number of variables are more diverse which in turn can be resulted in a broader analysis. Nevertheless, this does not necessarily means primary data is more reliable than secondary data obtained from national survey, because as explained before, previous research have successfully solved the issue regarding what type of variables that can be used for SES measurement without having to conduct primary data collection. This research will analyze SES particularly in the case of Indonesia where data from national survey is used to predict per capita expenditure which in turn directly determine SES classification. The mechanism of SES measurement in Indonesia, including the description of regression model as the analytical method, will be explained in the next section.

2.1.3. Socioeconomic Status Measurement In the Case of Indonesia

The general concept of the SES as well as the indicators and method used to measure SES carried out by previous research are described in the previous section in order to understand the basic knowledge of the implementation of SES measurement in Indonesia. Comprehensive information regarding deprived population in Indonesia can be obtained from *Pendataan Program Perlindungan Sosial* (PPLS) survey done in

household level. PPLS dataset is then used as an input for targeting households that are eligible for all social protection programme established by the central government

PPLS has been carried out three times; 2005, 2008 and 2011. Historically, first round of PPLS was completed as a part of the techniques to identify poor households for the distribution of *Bantuan Langsung Tunai* (cash transfer programme) in 2005. BPS performed both data collection and data processing for PPLS 2005 and PPLS 2008. There are 14 variables recorded following the guideline for "poverty criteria" developed by the BPS and then they applied a scoring system in which a certain weight is assigned to each of the SES variables to determine the deprived population. Weights are based on the level of influence of each variable to poverty. Lastly, the score is sorted from largest to smallest in which the higher the value, the poorer the household (BPS & Ministry of Social Service, 2012). The result of this scoring system is the four groups of deprived population which are: very poor, poor, moderately poor and vulnerable.

There are two major problems occurred while implementing the PPLS dataset as an input for cash transfer programme and "rice for the poor" in 2005 also the national health insurance (JAMKESMAS) in 2008 which are exclusion and inclusion error. Exclusion error is a problem occurred in the field because deprived households that should have been regarded as deprived were not listed. By contrast, inclusion error happened due to including non-deprived households into the list (BPS & Ministry of Social Service, 2012). The errors resulted into about 30% out of total population who received the aid from the three social protection programmes which is, according to report from Ministry of Social Service, still not covered all the deprived population. Critics were addressed both to the mechanisms in data collection and data processing then one significant improvement took place in 2011 which become the main attention in this research. Hence, in PPLS 2011 the ad-hoc institution who is directly responsible to the vice president of Indonesia namely National Team for the Acceleration of Poverty Reduction (TNP2K) joined the programme to increase the effectivity of poor targeting by developing the analytical method for data processing, whereas BPS became only responsible for data collection.

PPLS 2011 covers 32 variables that represents three major SES indicators which are housing features, assets and demographic characteristics of household member (Appendix 1). The main purpose of PPLS 2011 is to indicate household with the lowest welfare status based on per capita expenditure prediction. According to TNP2K (2013), PPLS 2011 has extended their coverage which is not only included low income people, but also reach up the middle income people as an attempt to extend the social protection programme beneficiaries from 30% to 40% out of the total population. The historical timeline of PPLS programme in Indonesia presented in Table 2.2.

Table 2.2. Summary of PPLS programme in Indonesia

	PPLS		
	2005	2008	2011
Actor:			
Data collection	BPS	BPS	BPS
Data processing			TNP2K
Indicators	14 variables	14 variables	32 variables
Analytical method	Scoring system	Scoring system	Proxy Means Test
Categorization	Very poor, poor, moderately poor, vulnerable	Very poor, poor, moderately poor, vulnerable	Decile 1, decile 2, decile 3, decile 4

Furthermore, the general process of data collection for PPLS 2011 is illustrated in Figure 2.4. Prior to the data collection process, BPS used data from PPLS 2008 database combined with National Census, to extract population in the low and middle income category, as a reference to identify the pre-list Targeted Households (THH). Afterwards, BPS employed three approaches to obtain the existing list of THH for the smallest administrative unit of the province. Step one is the verification process which is confirming the existence of population included in the pre-list THH, then followed by step 2 which is the public consultation with the head of the region and the community in order to get their perception of where the poorest households are actually located. With an updated THH in hands, BPS then conducted the interview to collect data on the SES indicators. In the process of *door-to-door* interview, there is a possibility of discovering households that were not included in the list after the step one and two are conducted. At this stage, *sweeping* process is carried out in which BPS will directly observe the condition of those "uncovered households" and if they met the criteria, the interview will be conducted right away.

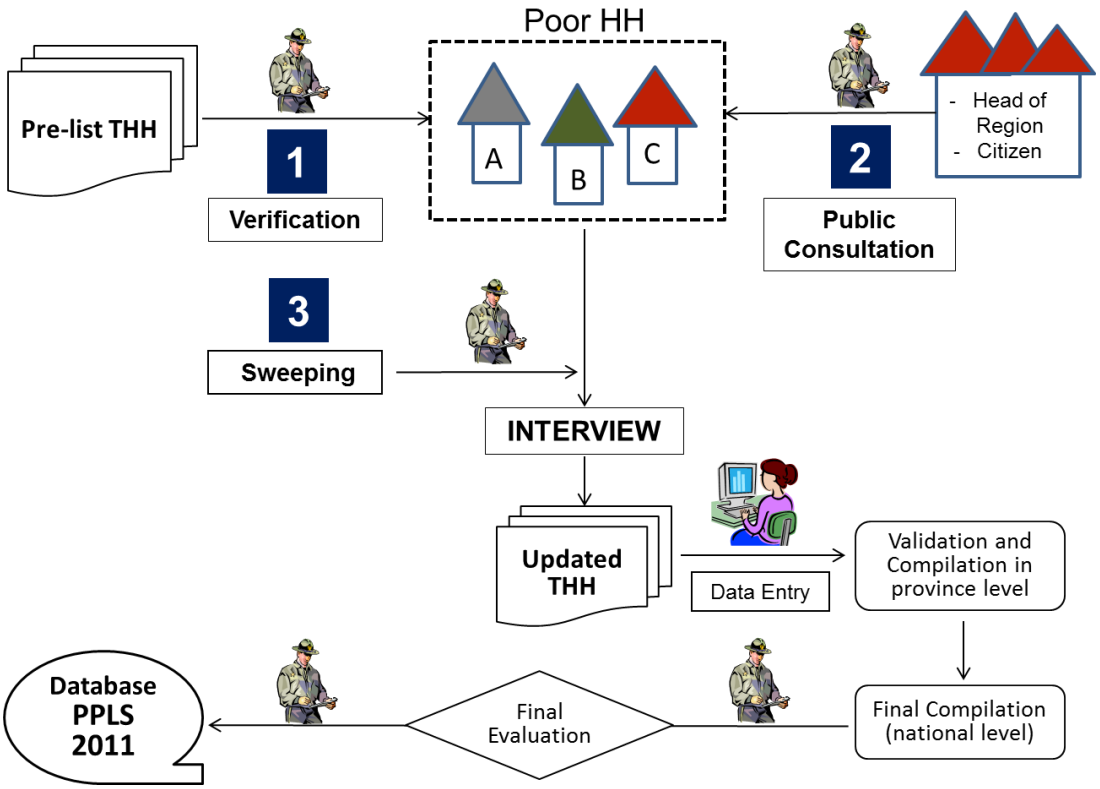

Figure 2.1. General process of PPLS data collection
Adapted from BPS (2011)

Ever since data processing is handled by TNP2K, the Proxy Means Test (PMT) modelling is developed to create the poverty ranking to determine deprived population groups in Indonesia. Basically, PMT is an approach to predict per capita expenditure in household level. The collected data on housing features, assets and demographic characteristics is expected to create a set of proxy for household expenditure or income, and the proxy are in turn used for poor targeting (Alatas, 2010). According to AusAID (2011), many developing countries such as Mexico, Peru, Bangladesh, Srilanka and Rwanda have adopted this technique because it has been said that PMT is "proven to work, particularly well in countries with high levels of informality and where personal and household income is difficult to verify with any degree of precision." (World Bank, 2009a:7). The basic formula of PMT in the case of Indonesia is as follow.

$$y_{ij} = \exp\left(\hat{\alpha} + \mathbf{x}'_{ij}\hat{\boldsymbol{\beta}} + \mathbf{z}'_{j}\hat{\boldsymbol{\theta}}\right) + \varepsilon_{ij}$$

Where

yij : per capita expenditure of household *i* in region *j*
α : intercept
β : estimated coefficient for household characteristics
Xij : vector of characteristics for household *i* in region *j*
θ : estimated coefficient for wealth index / location
zj : composite wealth index in region j
εij : error term

PMT model is applied differently in each municipality, hence, there are more than 400 PMT models in total because variable composite wealth index (zj) is unique for each muncipality. Using proxy variables, a model was created to generate the coefficient (β) for household characteristics which includes housing features, assets and demographic characteristics of household member (TNP2K, 2015). Wealth index was created by using Principal Component Analysis (PCA) technique with household characteristics as an input data. According to BPS in their report for PPLS 2011, wealth index is included in the model as a correction factor to fix the ranking in per capita expenditure prediction result. In general, wealth index is constructed as follow.

$$W_i = (f_1.a_{1i}) + (f_2.a_{2i}) + \cdots + (f_n.a_{ni})$$

Where

Wi : score factor
f : component factor
a : household characteristics variables

The result of PMT for PPLS 2011 suggested four groups of ranking. Decile 1 represents the lowest ranking which covered 10 % households with the lowest per capita expenditure, decile 2 for 10% households regarded as the second lowest SES with expenditure above decile 1, decile 3 for 10% households counted as the third lowest SES with expenditure above decile 2 and last decile 4 for 10% of fourth lowest SES with expenditure above decile 3. These four ranking represents 40% population with the lowest welfare status. However, consideration is that the ranking process is done in national level although each households might have different composite wealth index.

Table 2.2. gives an illustration regarding the statement of why PPLS 2011 not only covered low income group like PPLS 2008 did. The coverage of THH is larger in PPLS 2011 (40%) rather than PPLS 2008 (29%), it can be seen from the table that the two poorest households are defined as decile 1. Moderately poor and vulnerable households are classified into decile 2 and decile 3, respectively. PPLS 2008 did not cover population in decile 4 as a result of extended THH occured in 2011, therefore it is becoming clear that PPLS 2011 has covered more deprived population because not only the low income group tis included but also reaches up to the middle income group.

Table 2.3 Comparison of result in PPLS 2008 and PPLS 2011

PPLS 2008	PPLS 2011
Very poor households	Decile 1
Poor households	
Moderately poor households	Decile 2
Vulnerable households	Decile 3
	Decile 4

This research is going to apply the PPLS 2008 terminology instead of decile groups defined in PPLS 2011 to minimize the misconception of decile as in descriptive statistics, which is any of the nine values that divide the data into ten equal parts with each part represents 1/10 of the population. Moreover, misunderstandings can also be caused by the purpose of PPLS itself which is "targeting 40% population with the lowest welfare status", then the decile term is correct if we see the low SES population as a whole in Indonesia because, as mentioned before, the ranking system is done at national level. However, if we see the low SES population only in a particular city, consequently, the term may not be relevant again. For instance in the case of Cilegon where the low SES population is counted as 15% of the total population, that does not mean there are only two groups of low SES, decile 1 and 2, existed in the city. Therefore, using PPLS 2008 will give more meaning to further explanation regarding deprived groups especially for this research.

In summary, previous research have also demonstrated that by using the data on housing features and assets can be used to overcome the absence of income, consumption and expenditure information. Housing features, assets and demographic characteristics of household member are chosen as the SES indicators that are relevant for this research since they are accommodated within the PPLS dataset. Furthermore, this research focuses on the characteristics of deprived groups since the abundant information contain in PPLS dataset is available for the in-depth investigation.

2.2. Accessibility

Definition and concept regarding accessibility will be discussed first before heading selecting the most suitable method for this research which is about accessibility to health facilities.

2.2.1. Definition and Concept

Access is a multidimensional concept that describes the relationship between attributes of service need and characteristics of service delivery system (Cromley and McLafferty, 2002). There are five important dimensions of access and one of them is accessibility which stands as the geographical dimension of access. A study from (Aday & Andersen, 1974) defined geographic accessibility as a function of the time and physical distance that must be passed through to get care. Rosero-Bixby (2004) summarized that access has been traditionally measured by the distance or travel time to the nearest facility or by the presence of facility in the community. To date, the concept of accessibility is closely related to land-use, transport and human activities within the society (Neutens, 2015), where the system will provide an excellent opportunity for individuals and group of individuals to participate in activities that are available in various locations (Geurs & van Wee, 2004). Moreover, accessibility can be described as overall benefits gained from transport system and it is essential to evaluate the interrelationships between patterns of land use and the nature of transportation systems (Dong, Ben-Akiva, Bowman, & Walker, 2006).

According to Geurs and van Wee (2004) four components can be identified in measuring accessibility namely land-use, transportation, temporal, and individual.

- *Land use component* reflects the amount, quality and spatial distribution opportunities supplied at each destination as well as the demand for the opportunities at origin location. It is also shows the interaction of supply and demand for opportunities which resulted in competition in activities.
- *Transportation component* describes the transport system that indicates the disability for an individual to cover up the distance between origin and destination using specific transportation modes as a an impact from confrontation between supply and demand.
- *Temporal component* considers the temporal constraints such as the availability of opportunities at different times and the time available for an individual to reach the destination for certain activities.
- *Individual component* identifies the needs, abilities, and opportunities depend on the socioeconomic condition of an individual, for example: age, gender, employment status, income and education level.

As shown in Figure 2.5., each of the components and the interaction among them will affect the level of accessibility. Land use component reflects the distribution of activities that influences travel demand and trip behavior. Time constrains and people's opportunities are introduced by the effect of utilized opportunities. Furthermore, the individual component interacts with all other components, this is because it comprises a person's needs and abilities of time value, cost, efforts of the movement, and types of activities one would want to engage with.

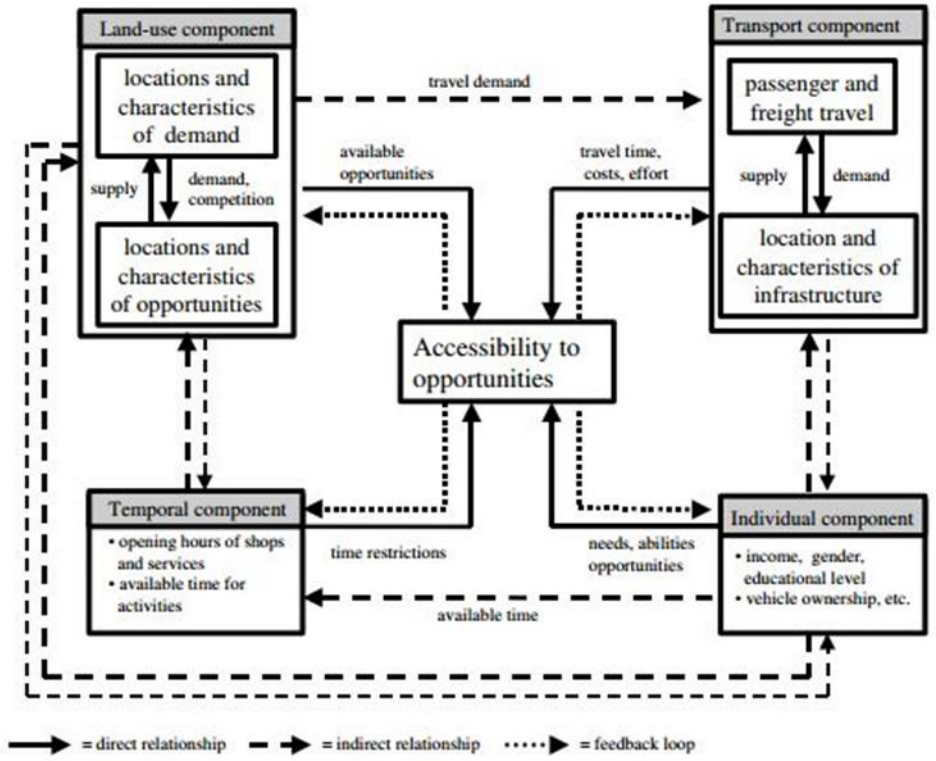

Figure 2.2. Relationship between accessibility component
Source: Geurs and van Wee (2004)

In addition, Cascetta et al. (2013) describe three focal elements in assessing the accessibility which are attractiveness, socioeconomic, and level of service. First element refers to the quality and quantity of opportunities in the destination area, socioeconomic element can be measured by income and also availability of driving license, with the last one is related to travel time and direct/indirect cost to reach the opportunities.

2.2.2. Accessibility Measure

Following the definition established by Geurs and van Wee (2004) there are four perspectives on measuring accessibility which focus on one or more accessibility components depending on desired perspective: *infrastructure-based, activity-based, person-based, and utility-based* measure. Table 2.3. explains the relationship between each measure and the components. In general, infrastructure-based perspective is closely related to transport policies. For example, this perspective can be used to describe travel times, average speed on the road network between two locations as well as the congestion problem. It is also considered as trip-based measure because it has similar key properties which is to examine one trip at a time and do not consider land-use impact on transport changes. Besides excluding land-use component, this approach is not very capable of treating temporal and individual components.

Table 2.4. Perspective on accessibility and components
Source: Geurs and van Wee (2004, page 129)

	Land-use component	Transport component	Temporal component	Individual component
Infrastructure-based		Travelling- speed; vehicle hours lost in congestion	Peak-hour period; 24-h period	Trip-based stratification, e.g. home-to-work, business
Location-based	Amount and spatial distribution of the demand for and/or supply of opportunities	Travel time and or costs between locations of activities	Travel time and costs may diffeer. E.g. between days of the week, or seasons	Stratification of the population (e.g. by income, educational level)
Person-based	Amount and spatial distribution of supplied opportunities	Travel time between locations of activities	Temporal constraints for activotoes and time available for activities	Accessibility is analysed at individual level
Utility-based	Amount and spatial distribution of supplied opportunities	Travel costs between locations of activities	Travel time and costs may diffeer. E.g. between days of the week, or seasons	Utility is derived at the individual or homogeneous population group level

The second perspective is the location-based accessibility. Geurs and van Wee (2004) includes distance, contour, and gravity-based (also known as potential accessibility) measure in this perspective. Distance measure is based on the work of Ingram (1971) regarding the relative accessibility which is defined as "the degree to which two places or points on the same surface are connected". The further away the points are, the less accessible they are. Distance measures are often used in land-use planning as standards for the maximum travel time or distance to a given location. Whereas, Handy and Niemeier (1997) divided accessibility measures into three classes based on the complexity of measurement: cumulative opportunities measure, gravity-based measures and utility-based measures.

A simple type of accessibility measure is cumulative opportunities, also known as a contour or isochronic measure which calculates the number of equally weighted opportunities that can be reached within a given travel time and distance. Cumulative opportunities represents comparable and absolute unit (Batty, 2009) because it emphasizes the number of potential destinations within a certain travel time (or distance) threshold and as a result it could give sense of various choices that are available to the residents, for example in health studies opportunities can be a number of hospital beds or medical doctor (Neutens, 2015). Under this measure, accessibility is considered as increase when number of opportunities increase and decrease as the distance to these opportunities increases, *ceteris paribus*, level of accessibility also will be decreased as the threshold becomes smaller (Paez et al., 2010). Outcome of contour measure is easy to compare and to understand, but it often involves the inconsistency and subjects in determining the appropriate threshold (Cascetta et al., 2013).

Furthermore, the more complex type of accessibility is the gravity-based measure or potential measure. The gravity measure is, so far, the most popular among accessibility measures. It is developed by Hansen (1959) adopting the Newton's theory of gravity. The equation for gravity-based model is as follow.

$$A_i = \sum_i D_j \, d_{ij}^{\propto}$$

Where

Ai : a measure of accessibility at zone *i* to all opportunities *D* at zone *j*

dij : distance between location *i* and j

α : distance parameter

However, the values resulting from gravity-based measure are not easily communicated as it combines land-use, transport elements and different weight at each opportunities unlike the contour measure, moreover the result can only be interpreted in relative terms by normalizing the values over particular range (Batty, 2009).

The third perspective is the utility-based approach. This measures were promoted based on random utility theory where the assumption is that people will select the alternative with the highest utility (Dong et al., 2006). Moreover, Williams (1977) on (Baradaran, 2015) noted that utility-based accessibility is associated with consumer welfare. Previous studies identified some disadvantages of this approach, one of them is that the indicators require an extensive data on locations and individual's travel behavior. Lastly, person-based perspective examine accessibility at individual level. According to the information provided in Table 2.3., this measure comprises individual properties such as trip purposes, transportation mode, income, age, gender, occupation, and education level. This approach, however, is less suitable for opportunities where the competition occurs, such as access to health facilities because it does not cover supply capacity constraints in the opportunities (e.g. number beds available).

As for the person-based accessibility. It analyses accessibility from individual's perspective by incorporating spatial and temporal constraints, such as the choices of activities or opportunities in which an individual can participate at a given time. According to Geurs and Van Wee (2004), person-based accessibility treated the temporal component explicitly and only implicitly described in other three perspectives. In relation to this research, since the infrasructure-based approach do not include land-use component thus it could not be applied because it is not considering the spatial distribution of opportunities. Person-based and utility-based typically focus in analyzing accessibility at individual level, meanwhile, the supporting data prepared for this research is in a city level. On the other hands, the location-based perspective is able to perform in a macro

level and it could give more emphasize on the spatial constraint in the supply of opportunities. Hence, it is the most suitable approach for the research. Moreover, many health studies implemented the location-based perspective as their analytical method.

Table 2.4. summarizes the example of research using different approaches under location-based perspective. Both distance and countour measure do not incorporate the temporal and indivual component yet contour measure or cumulative opportunities still proved to be a suitable method to identify the condition of health service availability for the population.

Table 2.5. Overview table on location-based accessibility

Location-based Perspective	Example	Components				Analytical Method
		Transport	Landuse	Temporal	Individual	
Trip-based (distance)	Apparicio, Abdelmajid, Riva, & Shearmur (2008); Páez, Mercado, Farber, Morency, & Roorda (2010)	√	√	x	x	Straight-line trip length
Isochrone-based (contour)	Rosero-Bixby (2004); Perry & Gesler (2000); Schuurman, Fiedler, Grzybowski, & Grund (2006); Delamater, Messina, Shortridge, & Grady (2012)	√	√	x	x	Catchment area using network distance
Gravity-based	Yang, Goerge, & Mullner (2006); Dai (2010); Dewulf, Neutens, De Weerdt, & Van de Weghe (2013)	√	√	√	√	Floating catchment area
NOTE √: include in the study x: not include in the study						

Different situations and purposes require different accessibility techniques, hence, although there are various techniques to measure accessibility, the best approach does not exist (Ertugay, 2006). Finally the level of accessibility in this research will be measured from location-based perspective using cumulative opportunities measure. This approach is the most suitable because it accommodates this research in answering one of the specific objectives which is to identify the level of accessibility by calculating how many populations from each SES groups that can be covered by extisting public health facilities. Apart from that, availability of the data do not allow this research to include temporal and individual component of accessibility. For instance, there is no information regarding the population's perception towards public health facilities, hence this method seemed to be appropriate because it relatively demands extensive data, moreover according to the theory and its application in health studies, cumulative opportunities measure indicates that all facilities are equally desirable by population regardless their welfare status as well as their preference of health service.

3. STUDY AREA

This chapter provides a general description on the physical and demographic condition in the city of Cilegon. Furthermore, an overview of how the health system is organized in Indonesia as well as the policies that related to minimum service standards for health facilities is discussed briefly.

3.1. General Description of Study Area

Cilegon is a coastal industrial city in the province of Banten, Indonesia. It is located in the northwest tip of the Java Island, at the edge of the Sunda Strait. The city was once a part of the Serang Regency, then improved its status to became an administrative city. On April 20, 1999, the city was designated as a municipality (the term municipality has been replaced by city since 2001). Cilegon is known as an industrial city, and became the center of industry in the western part of Banten. The city is crossed by the road and railway line of Jakarta, the capital city of Indonesia, and Merak which is one of the largest seaport in Indonesia that has become a key transport link and a major service provider for the heavy passenger and commercial ferry traffic between Java and Sumatra Island.

3.1.1. Administrative Unit

The government administration process in Indonesia has a descending level of administrative subunits. As of 2015, there are thirty four provincial level unit and each province is made up of regencies (*Kabupaten*) and cities (*Kota*). Under regencies and cities, there are districts (*Kecamatan*) and the lowest tier of the administrative hierarchy is villages (*Desa* or *kelurahan*). Based on Law Number 32 Year 2004, province, regencies and cities have their own local governments and it plays a greater role in administering their areas.

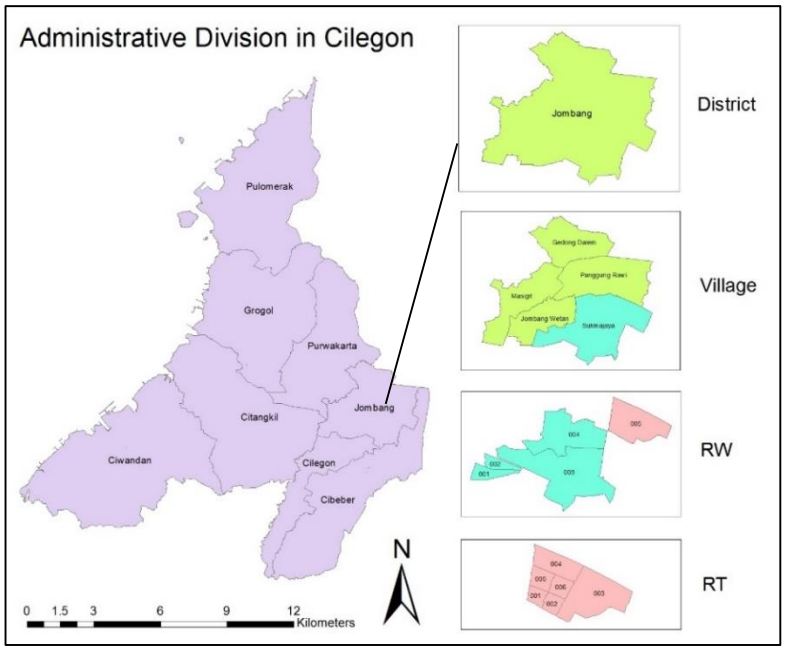

Figure 3.1. Administrative division in Cilegon

Many provinces in Indonesia, particularly in Java island, established another tier under the village which is RW (*Rukun Warga*) and each RW consist of several RT (*Rukun Tetangga*). RW and RT are not officially included in the division of administrative level set by central government, however the basis of formation

of their regions is written in the Decree of Ministry Home Affair Number 7/1983 that stated the extent of RW and RT areas are made up by the local community forum and both essentially served as subordinate administrative subunits in village level. Banten province has four regencies namely Lebak, Pandeglang, Serang and Tangerang, and also four cities; Cilegon, Serang, Tangerang, and Tangerang Selatan. The city of Cilegon which is selected as the study area has eight districts and forty three villages. The division of administrative unit is displayed in Figure 3.1. In the map, one district is taken as a sample to illustrate how the administrative unit is divided after the city. Jombang district has five villages and each village consist of several RW in which it bounded numbers of household groups. Lastly, RT regarded as the smallest administrative unit in the city and consist no more than 50 households.

3.1.2. Land Use

In 2010, most areas in the east and south is used for agricultural purpose. Commercial area located in the city center which mostly consist of traditional market, supermarket and retail complex. In western and northern part is the concentration of industrial activities. The main industrial activities in Cilegon are manufacturing and chemical industries. Cilegon is the city that has become the pillar for Indonesia's industrial sector and this sector is the biggest contributor by giving 70.3% to the total regional income. This research focus on residential areas where the population reside. Urban areas are concentrated in eastern part (Jombang, Cilegon and Citangkil) whereas the rural areas are distributed in the north (Pulomerak) and southwestern (Ciwandan) part.

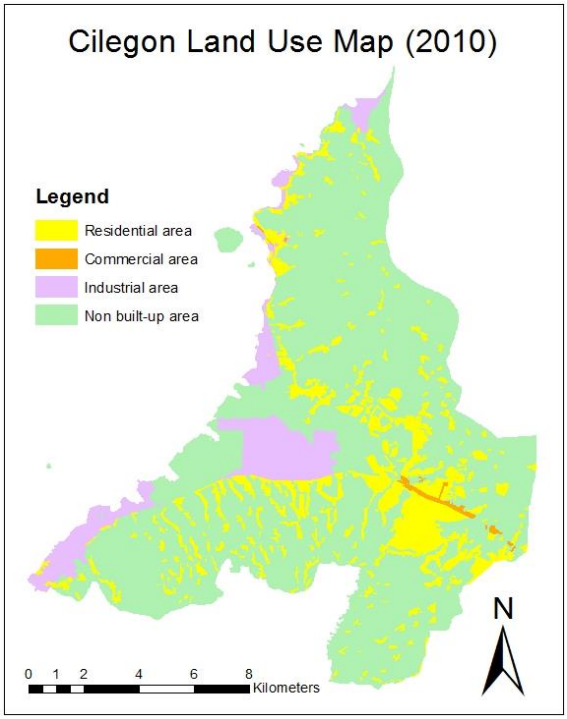

Figure 3.2. Land use

3.1.3. Demographic Condition

Based on the BPS (Cilegon in Figures, 2014) the total population of Cilegon is 393.147 inhabitants in 2013 with the composition of 51% male and 49% female. The population density in 2013 was 2269 inhabitants per square kilometer and the growth rate was 1,52% between year 2012 and 2013. Population density in Cilegon is shown in Figure 3.3. Classes in the legend represents the population density in each district. The most dense district is Jombang with the density of 6008 people/Km2. This district is considered as the city center of Cilegon where government offices and business activities are concentrated. In contrary, Ciwandan is the least dense district (1350 people/Km2) and it is located in the south western part of the city.

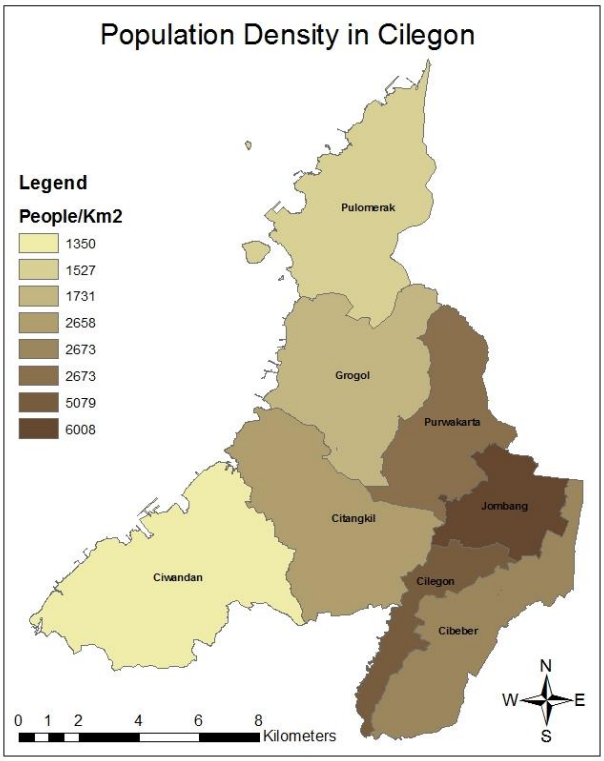

Figure 3.3. Population density in Cilegon

Furthermore, Citangkil district has the largest population whereas Purwakarta district is the least populous. Figure 3.4 presents the population growth trend of the city from year 2009-2013. It can be seen from the graph that in general, Citangkil district has the most significant population growth particularly between year 2009 and 2010. In the same period, Jombang and Cibeber district experienced a major growth in the number of population as well. As for the rest, the population growth does not show significant increase over the five years.

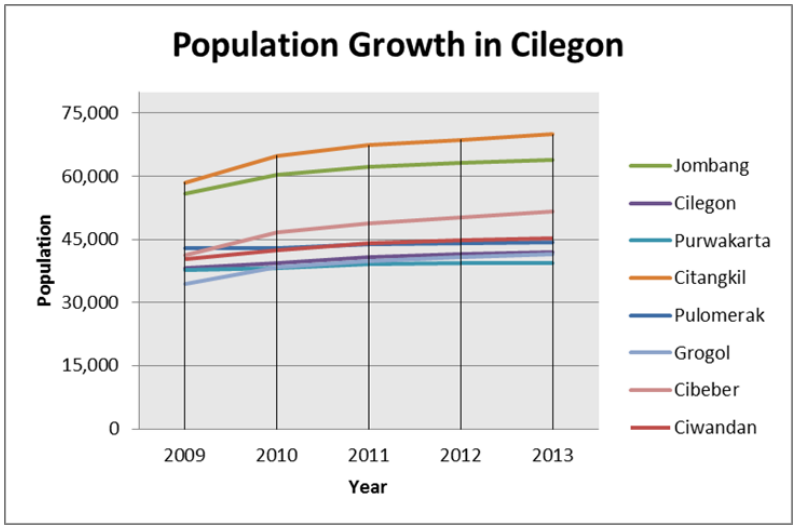

Figure 3.4. Population growth in Cilegon

3.2. Planning System and Health Policy

The first part of this section describes the planning system in Indonesia. It is continued by description of the health system as well as current health policies, particularly regarding the minimum service standards for health facilities and the national health insurance scheme.

3.2.1. Decentralization

In the period of 1950s and 1960s, many developing countries adopted centralized planning as a way to use limited resources to stimulate economic growth and moreover, to bring together the nation after the long western colonial rule. However, in practice, this system has resulted in the disparities between the rich and the poor, and between core and peripheral regions that were greatly widened (Firman, 2009). The somewhat failure of centralized planning for economic development caused many developing countries to decentralize responsibility for socioeconomic development planning and management to the local agencies and local government beginning in the 1970s. Decentralization can be defined in general terms as the *"transfer of authority, or dispersal of power, in public planning, management, and decision-making from the national level to subnational level or more generally from higher to lower levels of government"* (Rondinelli, 1981).

Indonesia experienced decentralization in 1999 under the guidance of Law 22/1999 on regional governments and Law 25/1999 on fiscal balance between the central and regional government. Indonesia's decentralization policy reform affected a shift in several government functions, responsibilities and tasks regarding planning and the provision of public services from the central to the local government domain. One important arrangement of Law 22/1999 on regional government is the elimination of the well-defined hierarchical relationship between central government, provinces and regencies/cities. Furthermore, regional heads at both provincial and municipal levels (*Gubernur* and *Bupati/walikota*) are elected by regional legislative bodies, also the regencies/cities (*Kabupaten/Kota*) which represent the third level in the previous five-tier administrative system became responsible for the implementation and daily operations of activities in such sectors as education, health, culture, public works, and the environment.

3.2.2. Health System and Organization of Care

Figure 3.5 illustrates the healthcare refferal system in Indonesia and it is divided into three types of care. First is the essential element of the health care system which is primary care. It is the first level of contact of individuals, family and community with national health system and it adresses the main health problems in the community. Primary care is provided in village and district level. At village level there is community level health center (Posyandu) which is a basic health activities organized by community and assisted by medical staffs, usually a nurse, and focus in a maternal and child care as well as elderly care for senior citizens. Meanwhile at district level, PHC (Puskesmas) is headed by medical doctor and it delivers maternal and child health care, general outpatient curative and preventive health care, pre and postnatal care, immunisation and communicable disease control programs. For the patient who needs specific or further treatment, secondary care (hospital class C and D) in the municipality level can receive referrals from the primary care. Secondary care has extended service that encompass health service by medical specialist (cardiologist, internist, ophthalmologist, etc.), inpatient care and an emergency unit. Tertiary care is considered as the top refferal hospital and should be able to provide advanced medical treatment such as specialist as well as sub-specialist care. For example, cancer management, neurosurgery, advanced neotalogy, which cannot be handled by secondary care. Tertiary care provided in the province level through hospital class A and B.

As mentioned in the previous section, since the decentralization era in Indonesia there are many aspects including health affair authority has been delegated to the local governments and making province and municipality to became the key of health services delivery. National health programme and minimum standards for health facilities is established by the Ministry of Health, which is the first tier in the hierarchy of health system in Indonesia. In the second tier there is a Provincial Health Agency which is responsible for health programme delivery in province level and the health service in hospital class A and B. Furthermore, in the city of Cilegon, delivery of health programme is under the authority of the Municipality

Health Agency and they are also responsible for the health service in hospital class C and D. Last tier of Indonesia's health system is the Head of District who is responsible for primary care service.

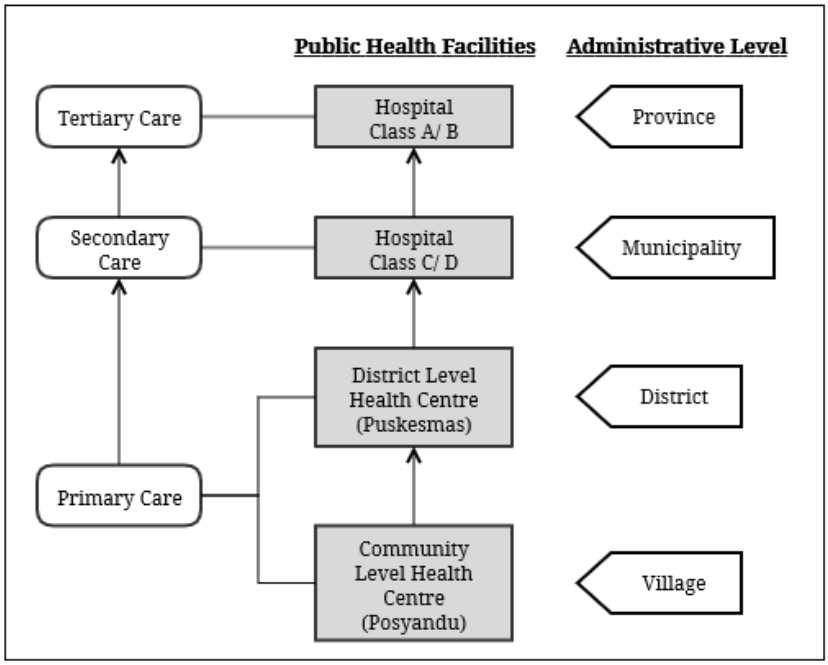

Figure 3.5. Healthcare organization in Indonesia
Source: Ministry of Health (2013)

3.2.3. Health Policies

- *Minimum service standards for health facilities*

Table 3.1 summarizes the minimum service standards for public health facilities according to two government institutions in Indonesia. Four indicators that are related to this research are described in the table. First is the scope which explains the minimum number of health facilities available in each administrative level. Second is the minimum ratio in the municipality level then followed by operation hours of medical staffs to illustrate the availability of services provided in health facilities. Lastlyis the location which emphasizes the maximum distance between population and health facilities and this will become the basis in determining the threshold for conducting accesssibility assessment in the next chapter.

There are three types of health facilities that will be included in this research: public hospital, PHC and clinics. However, there is no government institution that explicitly determines the maximum distance from population to hospital, consequently, the threshold for accessibility assessment to hospital will not be based on the minimum service standards established by Indonesian government. In addition, the regulation from the Ministry of Health also does not involve clinics in the minimum service standards for the scope and operation hours. This is because clinics are not part of public health facilities, means all the operational activities including medical staff are not funded by the government. Hence, the government does not have an authority to regulate the minimum number of clinics and how many hours in a day the medical staff should be available for services. However, the Ministry of Public Work considered clinics as part of facilities that should be able to provide health service to population and their existence also should be included in the regulation. Moreover, clinics are chosen for the accessibility assessment because the clinics to be included accepts the national health insurance which will increase financial access of the population to health facilities. Detailed information regarding the national health insurance will be explained in the next section.

Table 3.1. Minimum service standards for health facilities

Indicators	Description	Source
Scope	At least one unit of public hospital in both province and municipality level	Ministry of Health (2008)
	At least one unit of PHC (*puskesmas*) in district level	
	At least one unit of community level health center (*posyandu*) and Poskesdes in village level	
Minimum ratio in municipality/ city level	Medical post= 1:3000 people	(Ministry of Public Work (2001)
	Clinics= 1: 5000 people	
	Maternal and child healthcare= 1:10.000 up to 30.000 people	
	PHC= 1:120.000 people	
	Hospital= 1:240.000 people	
Operation Hour of Medical Staff	PHC and Hospital: • 07.30 – 16.00 (Monday – Thursday) • 07.30 – 16.30 (Friday)	Ministry of Health (2010)
	Emergency unit (Hospital Class A/B): 24 hours	
Location	PHC: • Should be in the center of district • Maximum radius is +/- 3 km accessible (road network) from settlements • Clean (far from waste disposal sites/ pollution)	Ministry of Public Work (2005)
	Clinics: Maximum radius is +/- 1.5 km accessible (road network) from settlements	

- *Health insurance*

In Indonesia health status is measured by mortality, morbidity, life expectancy and number of malnutrition case, as stated in the Decree of Health Minister Number 1202/Menkes/SK/VII/2003 regarding "Healthy Indonesia 2010" vision. Health development efforts in Indonesia aimed at improving community health status by providing the equal access to all basic health services for the citizen throughout the nation. One way to achieve the goal is to provide the national health insurance *(Jamkesmas)* which is a form of universal health insurance to increase demand for healthcare through low cost service. In 2004, Indonesia introduced the first phase of its plan to achieve universal health coverage in 2019 through a mandatory public health insurance scheme namely *Askeskin* which in 2008 evolved into *Jamkesmas*. This insurance provides wide ranges of health service including service for outpatient as well as for the inpatient. The type of service provided are health consultation, medical check-up, health service referrals from primary health cares to hospitals, accommodation for inpatient, medical treatment, medicinal drugs delivery and inter-hospital procedural services. According report from Pigazzini et al (2013), several improvement were realized in health system after the implementation of *Jamkesmas* with about 47 percent of poor and near-poor households were covered under the program, outpatient and inpatient utilization rates increased among program cardholders, levels of catastrophic payments declined and participation of private providers increased.

Jamkesmas is a part of social protection programme established by the central government, hence, selection of the beneficiaries conducted through PPLS. As mentioned in the previous section about the limitation of PPLS, the exclusion error which made the poor households that should have been regarded as poor are excluded from the list. Thus, the local government established a regulation called the local health insurance (*Jamkesda*) which is funded by local government budget to solve the equity issue of health service for thos excluded beneficiaries (Cilegon Government, 2015).

4. METHODOLOGY

This chapter presents the methodological approach of the research that includes study area selection, data collection, flowchart of overall research process along with the choice and motivation of analytical methods to be applied in order to achieve the research objectives.

4.1. Study Area Selection

For the selection of study area, units of administrative boundaries were taken. The city of Cilegon consists of 8 districts, 43 villages, and 1084 RTs in total. In this research, RT was chosen as a unit of analysis since it is the smallest administrative level existing in the city. Number of deprived households included in the analysis is 14.803 which represents approximately 43.200 people.

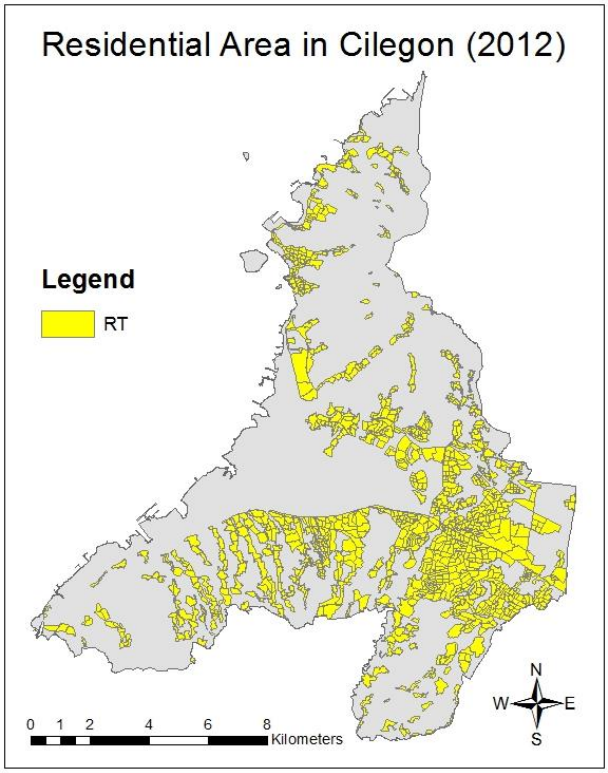

Figure 4.1. Study area selection

4.2. Data Collection

Secondary data is used as the basis in conducting the analysis. There are two types of data used which are socioeconomic data and spatial data which were obtained from various institutions. The following sub-sections explains the data collection along with the shortcomings in the datasets.

4.2.1. Socioeconomic Data

Table 4.1. summarizes the data collection for socioeconomic information. The PPLS dataset contains only population of deprived households and has 32 variables related to housing features, possession of durable goods and demographic characteristics (Appendix 1). The PPLS dataset for was obtained from the Cilegon Planning Agency.

Table 4.1. Datasets related to SES

Dataset	Scope	Source	Year	Format
PPLS	Household level	Cilegon Planning Agency	2013	Table (excel)
Population	Village level	Cilegon in Figures (BPS)	2009 - 2013	Table (document)

Following the description in Chapter 2, PPLS programme applied a Proxy Means Test (PMT) to rank the deprived households. Although the general formula of PMT is open for public knowledge, the issue of how the model was built and operated with proxy variables is unfortunately confidential. As a consequence, the information regarding the complete process to develop poverty ranking is missing. Instead of evaluating PMT approach by recalculating the model and developing possible alternative methods as an attempt for comparison, this study is restricted to investigate the given dataset in order to get a better understanding of how the socioeconomic groups are distributed within the city. Moreover, because the PPLS dataset contains SES variables only for deprived population, unfortunately this research cannot further investigate the SES characteristics for the non deprived population.

4.2.2. Spatial Data

Spatial data such as land use map, administrative boundaries, road network and location of health facilities were also obtained from the same institution which is Cilegon Planning Agency. Information regarding health system and health policies was gained from the various official documents such as Ministry of Health and Ministry of Public Work. Table 4.2. describes the list of secondary data obtained from various sources.

Table 4.2. Spatial data requirement

Dataset	Spatial Resolution	Source	Year	Format
Health service location - Number of health facilities - Location of health facilities	District level	Cilegon Planning Agency and Cilegon Health Department.	2012	Point feature
Road network	Municipality (city) level	Cilegon Planning Agency	2010	Line feature
Land use map	Municipality (city) level	Cilegon Planning Agency	2010	Polygon feature
Administrative boundaries	RT up to city level	Cilegon Planning Agency	2012	Polygon feature
Contour	City level	Cilegon Planning Agency	2010	Line feature
World View imagery	District level	Cilegon Planning Agency	2010	Raster

Two types of errors were found in the spatial datasets that potentially influence the analysis. The first is related to the completeness of RT boundaries. By overlaying World View imagery as a base with RT boundaries in ArcMap, it was identified that there are clusters of houses that do not have RT boundaries. Figure 4.2. presents the example of error taken in two different districts, yellow polygon represents the existing boundaries and the red polygons refer to the uncovered cluster of houses. The RT definition

according to Indonesia's government is that one RT consists of number of houses that are not more than 50 units then it can be assumed the uncovered cluster of houses are supposed to have boundaries and regarded as one or more RTs. However, it is not possible to delineate the missing RTs because the information contained in the PPLS dataset regarding the number of RT could not be retrieved to indicate the uncovered cluster of houses that will possibly belong to a particular RT. Therefore, this research is going to use the RT boundaries available in spatial dataset.

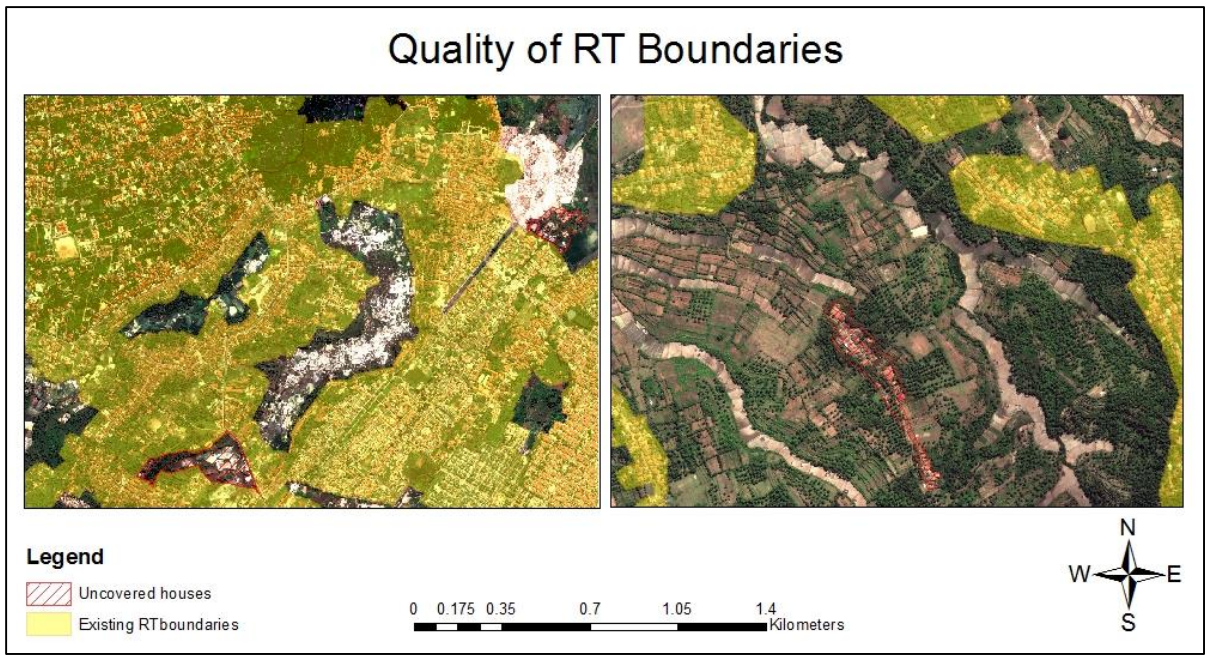

Figure 4.2. Example of RT boundaries quality

Second is the road network map. Road network is very essential for accessibility assessment in this research since it will determine the extent of service area of the public health facilities. However, it was found that the original datasets had a considerable amount of topological problems such as undershoots, overshoots, clustered nodes which are not snapped together and the line objects that do not have a node intersections. Apart from topological problems, the World View imagery also has been used to check the accuracy of road network and the result showed there are condiderable amounts inaccurate network as well as the omissions which make adding the missing network is need to be done. To overcome the shortcomings and errors that has been found in the datasets, a data preparation process was done and it will be explained more detailed in the next section.

4.3. Methodological Framework

Figure 4.3. illustrates the methodological framework that was developed to achieve the research objectives. The framework divided is into two main section. The first part is the data preparation which comprises three steps to manipulate and improve the available datasets, meanwhile, the second part elaborates the process of data analysis which consist of three sections following each specific objectives.

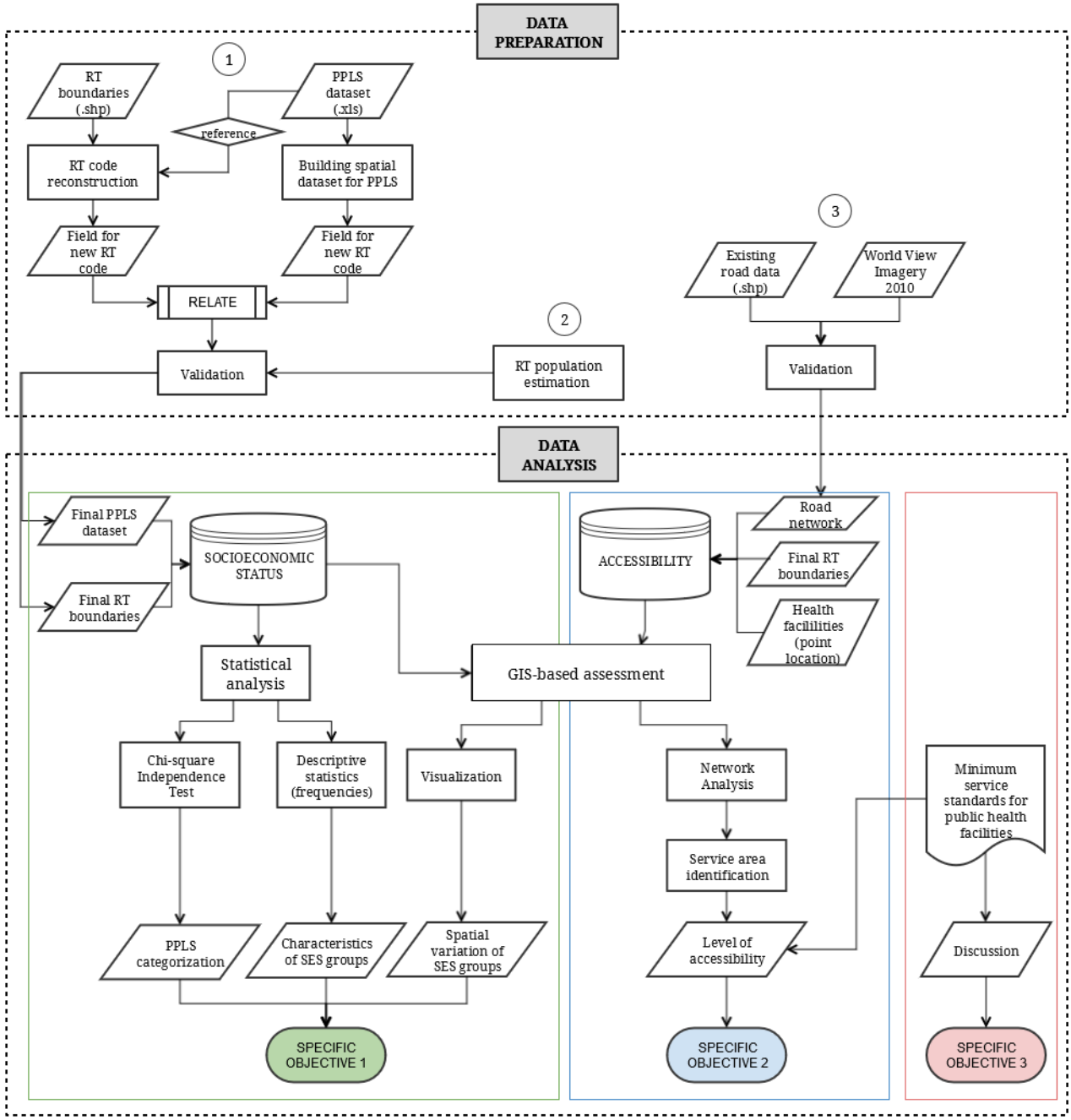

Figure 4.3. Methodological approach

4.4. Data Preparation

The purpose of spatial data preparation is to make the datasets fit for the analysis. This process is divided into three parts. It starts from the database reconstruction which aims to integrate the RT and spatial data (RT boundaries) with the attribute data (PPLS dataset) then followed by estimating the RT population. Last part is improving the road network by using high resolution image.

4.4.1. Database Construction

There are two separate datasets that need to be merged to establish a comprehensive database for this research, which are RT boundaries in shapefile format and PPLS dataset in excel file format. The first step is reconstructing the RT ID contained in RT boundaries. As shown in Table 4.3. the original ID structure listed in RT boundaries consist of 15 digits of number which represents the hierarchy in admistrative division. For example, the first three digits represents the district, the second three represents village, third three digits represents neighborhood and the last six digits represents RW and RT, respectively. However, the neighborhood level does not existed in PPLS table, hence, reconstruction was done by removing the neighborhood ID in RT boundaries which apparently has nothing to do with the records. In other words, the updated RT ID will not change the content nor the relevance of the overall records and can be used for the analysis.

Table 4.3. ID structure

District	Village	Neighborhood	RW	RT	ID RT
001	002	004	003	006	001002004003006

District	Village	RW	RT	ID RT
001	002	003	006	001002003006

Afterwards, the PPLS excel file was transformed into database file and similar process was done in ArcMap to create the same ID structure as RT boundaries. Next step is merging PPLS table with RT boundaries with relate function (*one-to-many*) and by this the information of how many deprived households as well as the population characteristics within one RT can be identified spatially. The validation step was carried out to check the consistency between two datasets. There are two important findings, first is that 19 RT boundaries are missing, meaning 384 deprived households will not be included into the analysis also the valid number of RTs became 1065 instead of 1084 as originally listed in PPLS dataset. This finding has strengthened the assumption explained in the previous section where the uncovered clusters of houses are supposed to have RT boundaries.

4.4.2. Estimating RT Population

The available dataset do not contain an information about the total population in each RT, hence, population estimation in RT level needs to be done. Estimation is based on the total population in village level. Then by making use of the information provided in the RT boundaries attribute table, data regarding the shape area is extracted to assume the RT population as shown in the equation follow.

$$\boldsymbol{P_i} = \frac{(\boldsymbol{P}.\boldsymbol{y_i})}{\mathbf{100}}$$

$$y_i = \left(\frac{x_i}{\sum x_i}\right).100$$

Where

$\boldsymbol{P_i}$: RT *i* population

y_i : Share area of RT *i* in a village

x_i : RT *i* area

$\sum x_i$: Village area

P : Village population

Another important piece of information that PPLS dataset already provided is the number of the deprived population, thus, the next step is to carry out an estimation for the high SES population in each RT by following equation.

$$\boldsymbol{p_i'' = P_i - p_i'}$$
$$p_i' = h_i' . z$$

Where,

p'' : Non-deprived population in RT *i*
P_i : RT *i* population
p' : Deprived population in RT *i*
h_i' : Deprived households in RT *i*
z : Average household size in village level

4.4.3. Improving Road Network

The existing road network data was obtained from Cilegon Planning Agency and this dataset is in shapefile format. However, as explained in the previous section that there are several errors contained in the datasets that potentially influence the result of analysis. Consequently, clean-up process was done to repair the topological mistakes, moreover, the missing datasets were fixed by using World View imagery from the same year as a guide for digitization process.

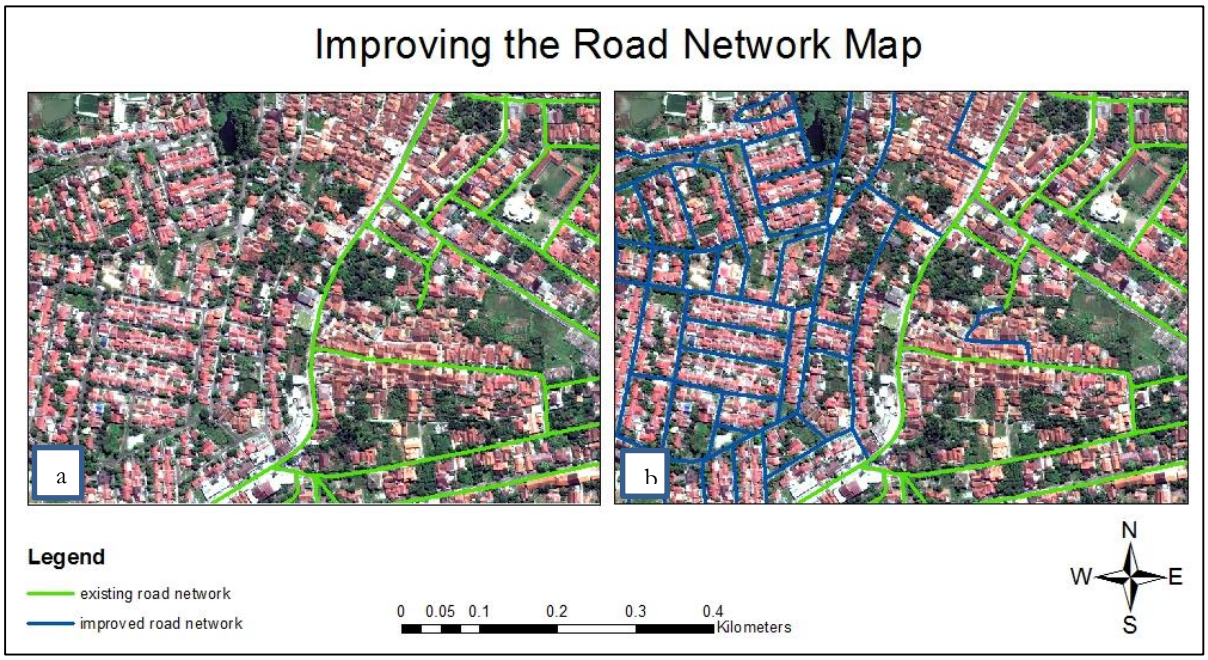

Figure 4.4. Digitization of road network map

Figure 4.4. presents the two images that represents the condition of road network before and after digititization process. First step in digitizing the road network map is overlaying the image with existing road network data, the green line in Figure 4.4. (a) refers to the available road network data and it can be seen that some lines that represent residential roads were missing. Then the blue line is the networks which were digitized visually in ArcMap, as shown in Figure 4.4. (b). The last step is to give attributes to the road network

data and classified the road into five types such as primary road, secondary road, tertiary road, residential road and path as well as adding the attributes for service area identification such as shape length in Km, estimated walking speed and travel time in hour.

4.5. Data Analysis

This section explains the two main analytical methods that have been used in answering the first and second point of the specific objectives which are identifying the characteristics and spatial variation of SES groups in Cilegon and assessing the levels of accessibility to public health care facilities across SES groups. First method is the descriptive statistics to describe deprived households characteristics for every group (very poor, poor, moderately poor and vulnerable). Afterwards, network analysis is conducted to identify the level of accessibility to public health facilities across socioeconomic groups.

4.5.1. Descriptive Statistics

This approach carried out to explore SES characteristics given by PPLS dataset. Since the dataset mostly contain categorical variables, thus, two essensial steps is conducted: frequency analysis and Chi-Square Independence Test.

- *Frequency analysis*

Descriptive statistics using frequency table is selected to identify how many households are included in each deprived group with respect to the SES variables. Frequency table of two variables that are presented simultaneously is called contingency table. Contingency tables are constructed by listing all the categories of one variable as rows in a table and the categories of the other variables as columns, then finding the joint or cell frequency for each cell (Stockburger, 2013). In this case, 32 contingency tables were generated where each of them represented the relationship in terms of frequencies between stratification and each SES variable. The analysis is operated through *Crosstabs* procedure in SPSS statistics software. Aside from absolute frequency calculation, it is used to determine the specific characteristics of each deprived group.

- *Chi-square Independence Test*

Contingency table do not give the information regarding to what degree the two categorical variables observed are related. Hence, in this research the purpose of Chi-square independence test is to examine whether the 32 SES variables are likely to have association with the stratification defined by PPLS which are very poor, poor, moderately poor and vulnerable. Pearson's Chi-square test examines whether there is a strong or weak relationship between two observed variables (Field, 2013). Suppose we have two categorical variables *x* and *y* and the hypothesis for Chi-square test is as follow:

H0: variable *x* and variable *y* are independent.
Ha: variable *x* and variable *y* are not independent.

The null hyphotesis states that variable *x* does not help in predicting variable *y*. The null hyphothesis will be rejected if the significance value is smaller than the significance level (α=0.05) means that the two variables are in some way related. Then, the generated chi-square value (x^2) itself is related to the degree of freedom (df), where:

$$x^2 = \text{df}$$
$$= (\text{rows} - 1)\ (\text{columns} - 1)$$

Given the same degrees of freedom, the larger the Chi-square value, the more "significant" the relationship is. In SPSS statistics software, chi-square test for categorical variable is a part of Crosstabs procedure, it can generate contingency table and the Chi-square simultaneously. In addition to the Chi-square test, SPSS also provide two other tests to measure the strength of association. Basically these measures modify the Chi-square statistics to include the sample size and degree of freedom and limit the magnitude of Chi-square test value from 0 to 1 (Field, 2013). The measures are:

i. Phi: Statistics test that is accurate for 2x2 contingency tables. However, the value of phi may not lie between 0 and 1 for the variables that have more than two categories because the chi-square value can exceed the sample size.
ii. Cramer's V: This statistics test ensures the value between 0 and 1 even when the observed variables have more than 2 categories. When both variables have only two categories, Phi and Cramer's V will generate an identical value.

Although these measure confirms the similar thing with chi-square test, but both could give an idea regarding the size of the effects. For example, we could judge whether the variables are low, medium or highly associated based on the 0 to 1 value. The more close the value to 1, the higher the level of association. To get more precise evidence of relationship between stratification and SES variables, this research will be using the Phi and Cramer's V test for the judgment aside the Chi-square value.

4.5.2. Measuring Service Area of Public Health Facilities and the Level of Accessibility

Network analysis is one of the significant and persistent research areas in geographic information science. Common applications of network analysis are route finding, route planning, finding the closest facility by travel time or distance, and calculation of service areas. In this research, network analysis will be used for identifying service area of public health facilities in Cilegon.

Spatial analysis functions for networks are supported by GIS sofware packages, such as optimal-path finding which generates a least-cost path on a network between a pair of locations using both geometric and attribute data and network partitioning which assigns network elements in form of nodes or line segments to different locations using predefined criteria or threshold (de By, Husiman, & Kraak, 2012). Identification of health facilities' service area can be performed by using network partitioning function embedded in ArcMap's network analyst tool by using topographic and road network dataset as the cost factor. The the time intervals were set as an impedance for every 10 minutes from 0 up to 60 minutes walking time. In creating the service area, the first procedure used for polygon generation is "overlapping" where polygons from the facilities may overlapped if they are located close to each other. Second procedure is the "rings" as the overlap types where the service area will not calculate the area of a smaller breaks, thus, every walking time interval has their own service area polygon. Finally, the output will come in a shape of service areas which follow along the road.

To identify the level of accessibility for the population in each SES groups, selection process was done by using the approach presented in Figure 4.5. The purpose of this approach is to extract 50% area of RT boundaries that overlapped with the service area polygon to be regarded as the served areas, means if the service area polygon only covered less than 50% of the RT boundaries area, they will not be considered as served areas. The shortcoming of this approach is the underestimation of number of population served by health facilities because it does not count the served population in RT which only covered less than 50%. Apart from that, there is need to assume that population is distributed evenly throughout the RT. Nevertheless, this approach is could generate more precise result for the level of accessibility compared to

if the selection method only relied upon the default method provided in ArcMap such as intersect, contain or centroid.

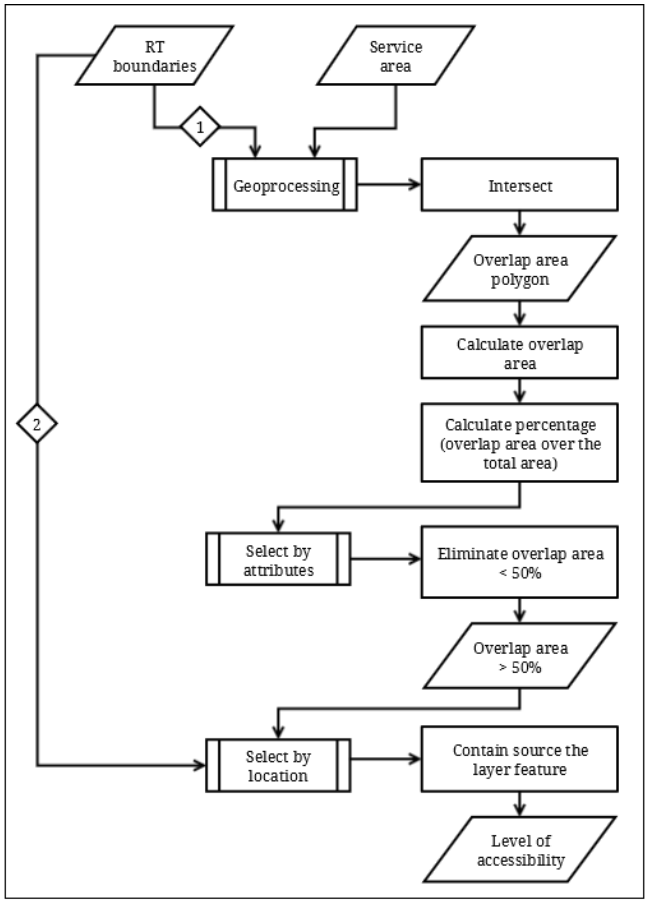

Figure 4.5. Flowchart to identify the level of accessibility

In the first phase of the process, intersect procedure embedded in geoprocessing tool was performed to create polygons that shows the overlap areas between the RT boundaries and the service area of the health facilities. Afterwards, two new fields are added to the attribute table of overlap area polygon. The first field contain the total area of the overlap areas then followed by calculating the share of overlap area over the original total area of RT boundaries for the second field. Querying process was done to eliminate the overlap area that less than 50%, hence, generate the new polygon that provide overlap area more than 50%. The second phase is the process of selection for the served areas using the procedure that provided by ArcMap which is "contain source the layer feature". This method select the RT boundaries that contained the entire feature of the overlap area polygon. At the end, the level of accessibility of health facilities to the population across SES groups can be identified.

5. RESULT AND DISCUSSION

This chapter discusses three main result from the analysis process. First is the identification of spatial variation for each SES groups. Afterwards, descriptive is conducted to examine the main characteristics of deprived groups based on PPLS 2011 stratification. Furthermore, the evaluation of accessibility level is observed by calculating the number of population served by health facilities in each RT based on the cumulative opportunities approach. There are three types of health facilities considered in this analysis: hospital, primary health center and clinics.

5.1. SES Categorization and Household Characteristics

This section evaluates the result of PPLS programme in producing the derpived groups which are very poor, poor, moderately poor and vulnerable. Descriptive statistics was conducted in order to obtain the characteristics of each deprived group with respect to the predetermined SES variables. Afterwards, to what degree the characteristics described in a group is systematic to the existing categorization can be examined.

5.1.1. Chi-square Independence Test

This statistical test is carried out to identify the degree of association between SES variables with the SES categorization. The Crosstabs procedure was carried out for the SES categorization over the each of the SES variables. Table 5.2. summarizes the output value of statistical test for each 32 SES variables.

As mentioned in Chapter 4, judgement for the association level is based on three output values: Pearson chi-square, the asymptonic significance for two variables observed and the Cramer's V. Out of all variables, there are 27 characteristics showing the evidence of relationship with SES categorization while the rest are having a relatively low chi-square value as well as high significance value more than α=0.05. This is the condition in which the null hypothesis where there is no association between the two variables must not be rejected. To see size of the effect, all the SES variables is reevaluated through the identification using Cramer's V value. The highest Cramer's V value for all SES variables is 0.618, thus, the further judgment of association level is divided as follow.

0.0-0.25 = Low
0.26-0.50 = Medium
> 0.50 = High

The cut-off values for the Cramer's V value could affect the judgement for the level of association. For example, if the three classes are made out of equal interval classification method from 0 to 1 then 70% of the total SES variables will be categorized as having low association, the other case is if not only three classes were made then perception of the level of association could be different. Therefore, it is also better to check the degree of the Chi-square value as well. However, in this research, the three classes were considered to simplify the magnitude of Cramer's V value because it makes explanation for the level of association become more straightforward.

Only variables that have medium and high association will be retained, considering the likelihood of strong influence to deprived group categorization if the SES variable is changed. The result shows that out of 27 variables there are 12 variables identified as having relatively strong evidence of relationship with SES categorization. Furthermore, a very limited variables from demographic characteristics appeared with relatively good chi-square as well as the high Cramer's V values which shows a weak relationship with the SES categorization. This statistical test demonstrates that apparently in the case of Indonesia, housing

features and assets variables are the better predictor to determine the deprived population. Unfortunately the data of SES characteristics for non-deprived group is not available, as a consequence, this result only relevant for the deprived groups.

Table 5.1. Chi-square and Cramer's V test result

Key Indicators	Variables	Pearson Chi Square	Sig.	Cramer's V	Level of Association			
					High	Medium	Low	None
Housing features	Housing area (m2)	373.54	.023	.298			√	
	Housing ownership	32.408	.006	.088			√	
	Flooring	330.162	.000	.280		√		
	Wall type	57.819	.000	.143			√	
	Wall condition	495.117	.000	.594	√			
	Roof type	23.322	.78	.074				√
	Roof condition	385.151	.000	.524	√			
	Drinking water source	180.694	.000	.190			√	
	Water Acquisition	107.895	.000	.277		√		
	Electricity	43.113	.000	.142			√	
	Wattage	14.208	.003	.101			√	
	Fuel for cooking	366.203	.000	.360		√		
	Sanitation	933.363	.000	.577	√			
	Sewerage system	484.502	.000	.588	√			
Assets	Car	10.449	.015	.086				√
	Boat	6.689	.082	.069				√
	Ship	6.64	.092	.066				√
	Motorboat	3.757	.289	.052				√
	Motor ship	5.999	.112	.065				√
	Motorcycle	536.176	.000	.618	√			
	Bicycle	77.32	.000	.235		√		
	Refrigerator	343.887	.000	.495		√		
	Gas tube	55.153	.000	.198			√	
	Handphone	212.164	.000	.389		√		
Demographic characteristics of HH's head	Age	46.007	.000	.128			√	
	HH size	155.781	.000	.192			√	
	Marital Status	58.211	.000	.144			√	
	Chronic disease	65.515	.000	.125			√	
	Disability	33.147	.044	.089			√	
	Education level	116.378	.000	.180			√	
	Occupation	74.295	.000	.163			√	
	Income	151.572	.000	.288		√		
	Health insurance	5.346	.148	.062				√

5.1.2. Household Characteristics

The Chi-square independence shows there are 12 variables that can explain general household characteristics across deprived groups which represented by the high and medium association with SES categorization. Number of 14.083 households listed in PPLS dataset were explored using frequency analysis and the complete table of the result is provided in Appendix 2. The summary of the deprived group characteristics presented in Table 5.2.

Table 5.2. Summary of the deprived household characteristics

Very Poor	Poor
Housing characteristics: Owned a private house with bad quality of housing material. Using improved water source. Most of them do not have private sanitation facilities and they are not using appropriate sewerage system . **Asset:** Overall having a higher rate of transport mode and appliances possession compared to the poor group. **Demographic characteristics:** Low education level represents by the highest rate of primary school graduate. Average monthly income under IDR 500,000	**Housing characteristics:** Owned a private house with bad quality of housing material but slightly better than the very poor group. Less utilization of improved water source. 99% owned private sanitation facilities with appropriate sewerage system. **Asset:** Overall having lower rate of possession of transpor mode and appliances compared to the very poor group. **Demographic characteristics:** More household's heads graduated from secondary and high school. Average monthly income above IDR 500.000
Moderately Poor	**Vulnerable**
Housing characteristics: Live in a bigger house, ability to rent house increases and better quality of housing material. Increasing use of unimproved water source but having higher ability to purchase good quality water. Ownership of private sanitation facilities decreases, more households using communal facilities, nevertheless, more appropriate sewerage system. **Assets:** Higher rate of possession of asset variables compared to the poor group. **Demographic characteristics:** More household's head graduated from high school and university. Average montly income above IDR 1,000,000	**Housing characteristics:** Live in the biggest house among other groups, highest rate of good quality in housing material. Using more improved water source and having the highest ability to purchase good quality water. Lowest rate in utilizing inappropriate sewerage system **Assets:** Higher rate of possession for some asset variables compared to moderately poor group. **Demographic characteristics:** Lowest rate of household's heads who has no education, more of them graduate from higher education Highest income level, 5% of the households have income above IDR 2.000.000

Furthermore, the following explanation regarding the characteristics of deprived household in Cilegon is divided into three parts according to the main indicators that underlies SES categorization in PPLS programme: housing features, assest and demographic characteristics.

- *Housing features*

  Better-off households are tend to have bigger house. To simplify the interpretation of categorical variables, some of the categories contained in housing features variables is classified into two groups with each representing the best quality and the inferior. Moreover, in deciding which one from the categories is the best quality, this research used the guideline from BPS (2012) amd WHO (2012) regarding the criteria for appropriate housing. Above 80% of deprived households own a private dwelling and the frequency for non private ownership shows a small difference between group. One striking information that can be retrieved from the result is the ownership of private house is surprisingly higher for very poor than vulnerable group. Next variable is the materials used for house which are flooring, wall and roof. In flooring, soil and cement are considered as the inferior materials. 30% of soil flooring users are coming from the very poor group and as the status gets better the usage rate of soil is decreasing. In vulnerable group the rate shows a significant improvement in using other type of flooring (wooden or tile) which considered as a the best quality. There is a variation across the group in the rate of utilization of wall material. Households in poor group used bricks and the utilization of bricks slightly decreases in moderately poor group and somehow increases again on the vulnerable group, moreover, the very poor households utilize less brick than poor group. Out of six categories of roof, clay is considered as the best material and most of deprived households used clay roof. Furthermore, physical housing condition also can be determined by maintenance effort. More than 60% of deprived households are having bad condition of roof and wall, nevertheless, the result shows a better condition as the status gets higher.

  Access to safe drinking water is often measured by the percentage of the population using improved drinking water sources. More households from the very poor obtain water from unprotected spring compared to the other group. Vendor-provided water categorized as an unimproved water source because it represents a bad quality of water availability in particular area. On the other hand, it may indicates the purchasing power of a population because the more they consumed vendor-provided water then the more amount of money they have to pay. As the household status gets better, the use of vendor-provided water is increasing whereas the use of unprotected spring is declining. The interesting feature of this variable is the access to tap water, protected spring and well which are supposed to be an improved type of water source is higher in the lower status groups. In addition, the lower categories have the higher rate of households that do not pay to obtain water. This indicates two things, ability to pay and the availability of water. It is somehow relevant with the access to water, for example the very poor households do not purchase water but they have the highest access to unprotected spring and well. Households from vulnerable group are able to pay for water and it is shown on the highest rate of vendor-provided water utilization. As for the sanitation, very few used communal facility. For the lowest and highest welfare status have consistent result, most of the households in very poor group do not own sanitation facility and they tend to use inappropriate sewerage system, in contrary, the vulnerable group shows the highest rate of private sanitation facility and good sewerage system. Interestingly, poor households owns the most private facility compared to the other but some of them do not own a proper sewerage system. Last variable in this category is the fuel for cooking. The result is somehow shows a variation in using fuel types among the deprived groups, however it can be concluded that the utilization of gas, which is considered as the best quality, is increasing as the status gets higher.

- *Assets*

  In PPLS survey, data collection regarding the assets basically is a closed question method. BPS listed variable of six transport modes (car, boat, motorboat, motorship, bicycle and motorcycle) and three household appliances (refrigerator, gas tube and mobile phone) to be answered as yes or no by the

participants. The overall result for assets variable is somehow bizzare. For instance, in some variables, the very poor group is having higher rate of possession than the poor group, then the rate increases in moderately poor and improved or become smaller again in vulnerable group. A meaningful difference only occured in the possession of motorcycle, refrigerator and mobile phone in which the ownership of these asset variables is consistent to the SES categorization where the very poor households own less compared to vulnerable households.

- *Demographic characteristics*

  Last indicator observed in the construction of deprived population group is the demographic characteristics. As it can be seen in Table 5.2. there is only one variable which shows an evidence of association with SES categorization which is the average monthly income. The very poor group have the smallest average income which is under IDR 500,000 per month and household's head in higher deprived groups tend to have higher income such as in vulnerable group there are more household's head earned above IDR 2,000,000 per month.

  There is an increasing in education level that consistent with the increasing of income rate and it can be identified from the number of household's head whose not having formal education are declining as the status gets higher also in the higher groups there are more household's head graduated from high school and even the university. Although the result from the Chi-square independece test shows the variable for education level has low association with SES categorization which represented by Cramer's V value, the Chi-square value is actually presents a small difference with income variable. In addition, health-related variables which comprises the household's heads who suffered from disability, chronic disease and the membership of national health insurance, are not have significant impact in determining the SES categorization because the frequency table shows above 80% of household's heads are healthy and the distribution of number of the household's head who suffered from disease and disability are similar across the groups. Furthermore, the membership of national health insurance can be described as good as 80% of them already being the beneficiaries and the largest share of it is concentrated in very poor group while the rest are having similar rate.

5.2. Spatial Variation of SES Groups

5.2.1. Spatial Distribution of Deprived Population

Two maps presented in Figure 5.1 to indicate the spatial distribution of deprived population. First map shows the spatial distribution in absolute number. Type classification used is the equal interval. The largest deprived population concentrated in the southern part of the city, some of them resided near the city center in the eastern part and some are resided in the hilly areas in the northern side of the city. Whereas the least number of deprived population located mostly around the area of the city center. Furthermore, absolute number divided over the total population highlights the largest share of deprived population. They are mostly concentrated in the outskirts of the city especially in the southern and northern part. Out of eight districts in Cilegon, three of them which are Ciwandan, Pulomerak and Grogol district were designed for industrial activities purpose and apparently these districts are where the deprived population mainly distributed. This explains the deprived population are resided in the areas which actually not a landuse for settlements.

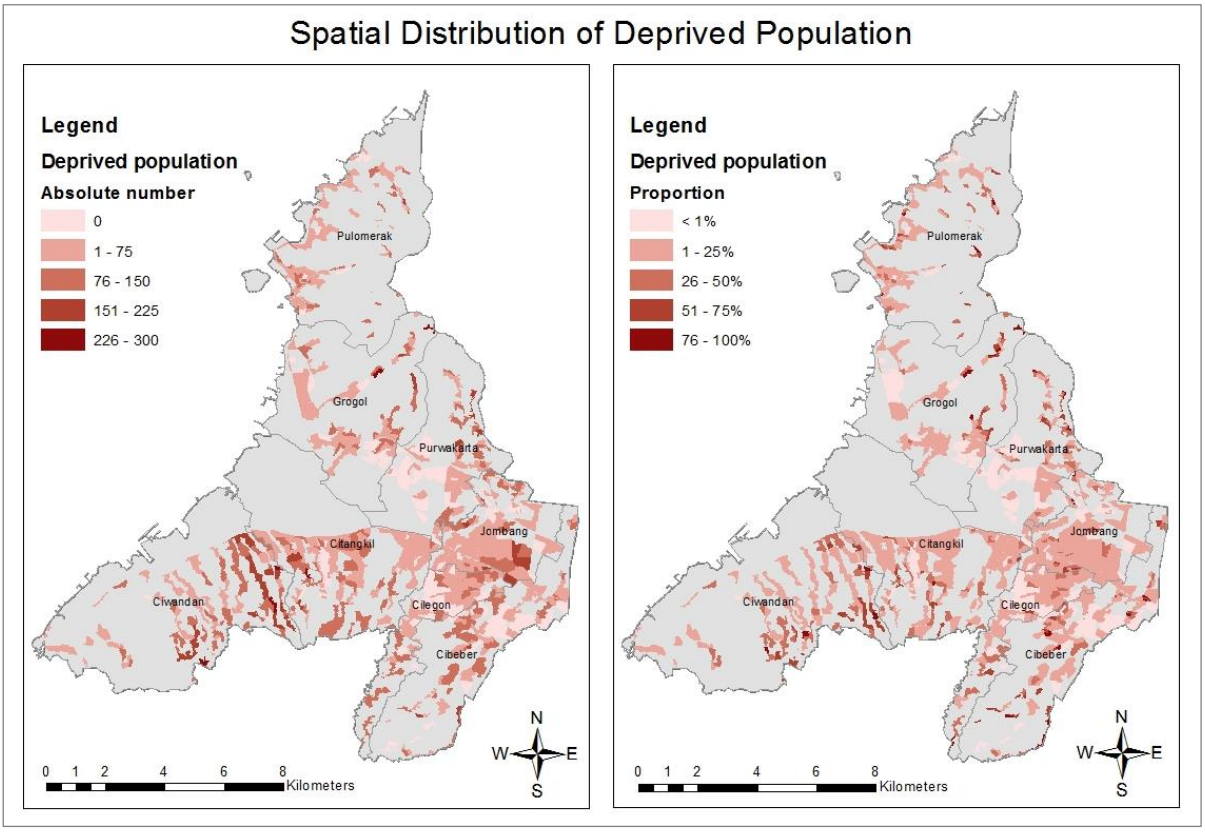

Figure 5.1. Spatial distribution of deprived population in Cilegon

Meanwhile, the city center area which located in Jombang district is the center of econonic and business activities and it has 20% of deprived population. It indicates that the city center probably is more populated by non-deprived population. In addition, since the PPLS programme has four tier of groups which categorized the level of welfare status within the deprived population, thus, the spatial distribution of deprived population can be identified more detailed (Figure 5.2.).

The very poor population are mostly concentrated in northern and southern part of the city, Grogol and Ciwandan district respectively. Apart from their function as the industrial areas, the concentration of population in these districts are very close to the city border. According to ITB (1994) in Indonesia there are four socioeconomic characteristics of population who live in border areas. First is the isolated location which in turn affect the level of accessibility to public services as well as the mobility of the population, second is the low level of education and health status as the impact of limited both physical and social infrastructure. The third one is the low welfare status that can be reflected by the number of poor population which caused by the low level of job opportunity and lastly is related to the lack of information transfer from the government. Following these characteristics, it has been described in the previous section that the very poor population tend to have low education level that represented by larger number of household's head who are not having formal education compared to the other groups. Moreover, the very poor group has the largest number of unemployed household's head and the lowest average monthly income. This explains the reason why the population of this group are more concentrated in the border areas.

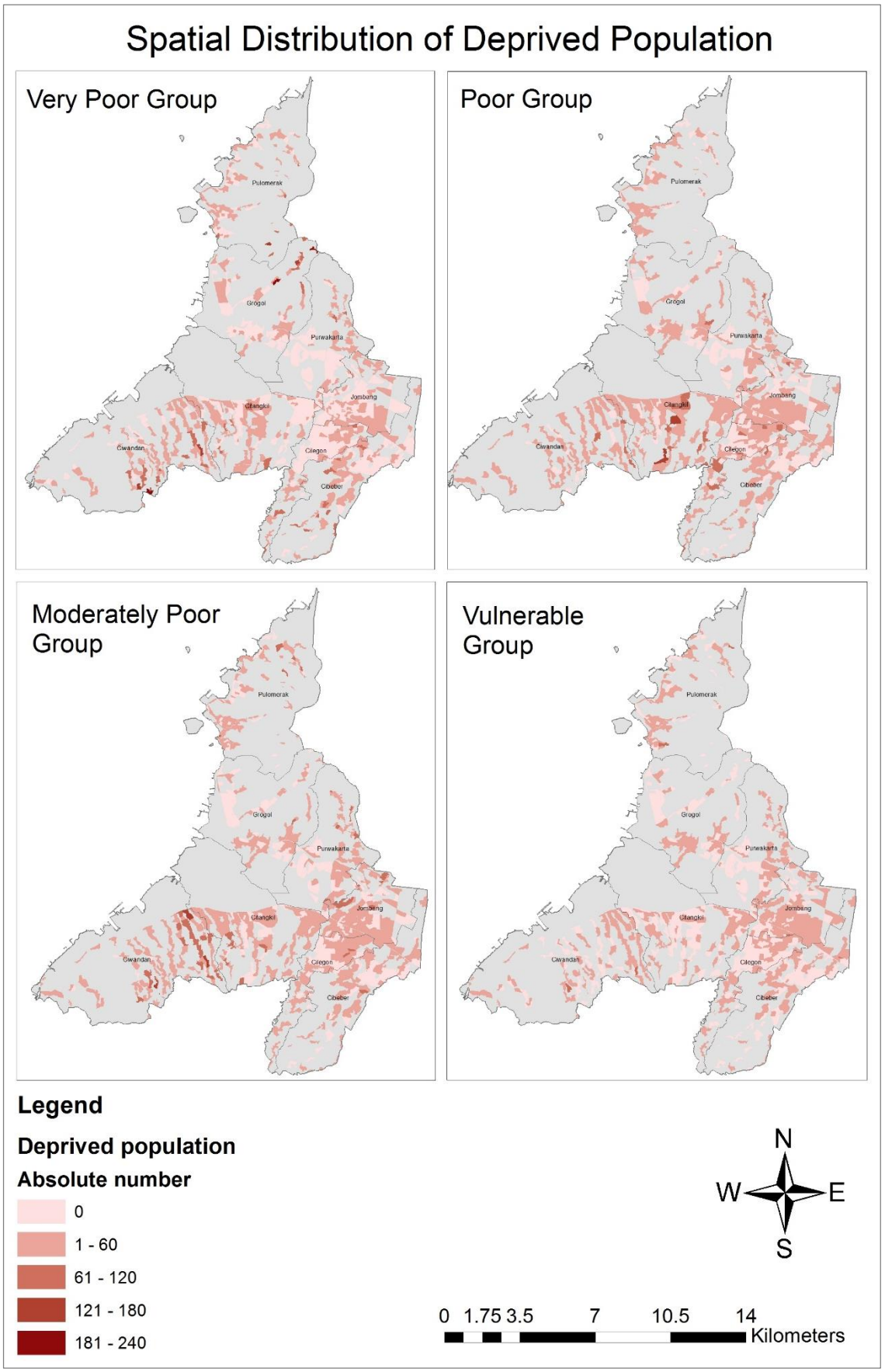

Figure 5.2. Spatial distribution of for each deprived group in Cilegon

The poor population is more concentrated in the western part of the city center, particularly Citangkil district, and the rest are mixed together along with the population from moderately poor and vulnerable group. It can be identified by looking at the number of population between 1 and 60 that distributed almost throughout the city. The moderately poor group has the highest number of population and some of them are located in Ciwandan district, the same location where the very poor group is concentrated. This indicates that Ciwandan has more deprived population compared to the other districts. Vulnerable group has the least number of deprived population and they are distributed more in the city center area with the average number of population is approximately 16 person in each RT. Based on this information,it can be said that location has become one of important factors that may influence the socioeconomic status of the population. Two contrast result can be identifed from this result, the very poor population are located away from the center, and the more better-off deprived population which included in vulnerable group are resided around the city center area. Hence, it can be summarized that as the SES get higher the population is tend to live closer to the city center.

5.2.2. Spatial Distribution of Non-Deprived Population

Using the estimated data explained in Chapter 4, similar process was done to create spatial distribution of the non-deprived population (Figure 5.3.). There are 341.796 non-deprived population in Cilegon, it is about 86.75% from the total population. In absolute number, the large population of non-deprived group is located in only several RTs spread mostly in the city center. The average number of non-deprived population in one RT is 1-772 inhabitants. With relevance to the deprived population, the southwestern part of the city (Ciwandan district) has the least non-deprived population. Moreover, population density in that district is also the lowest compared to the other district. Furtermore, the proportion of non-deprived population located almost in all part of the city except the outskirts where deprived population are mostly concentrated. There is a real estate complex developed in southern part of the city center (Cilegon district) which make there are a lot of non-deprived population resided in that area.

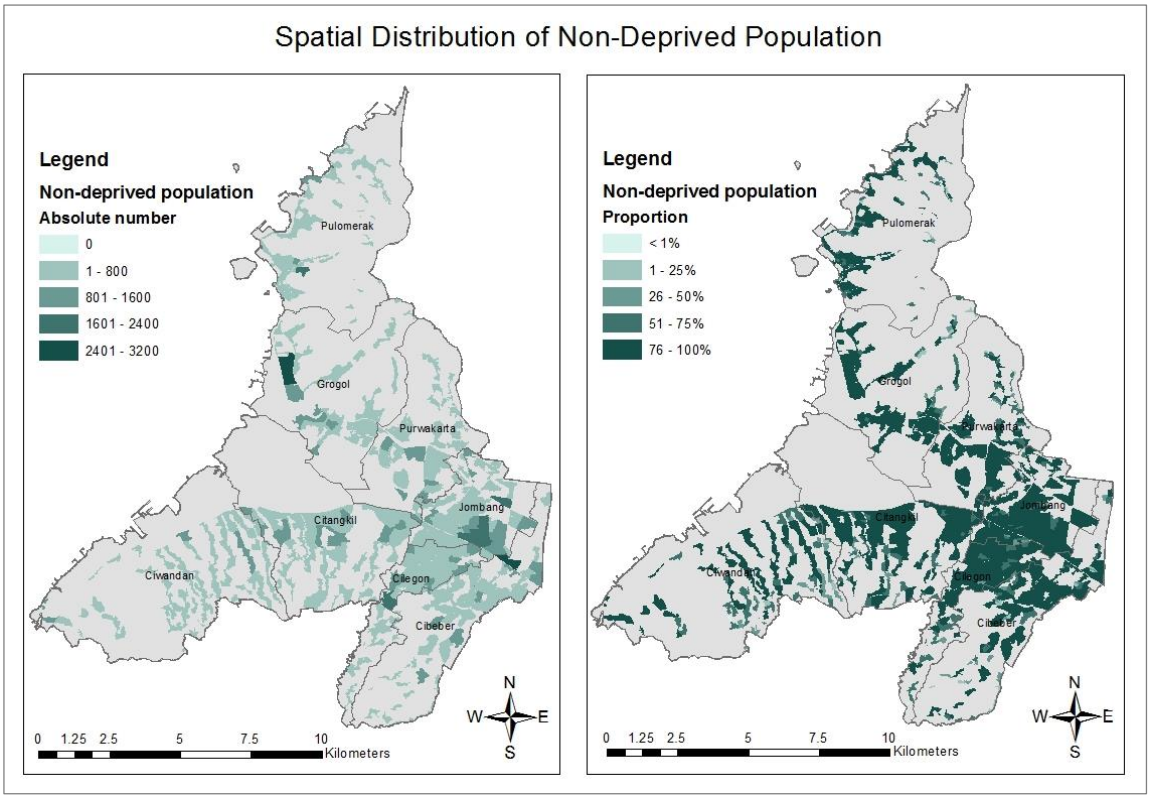

Figure 5.3. Spatial distribution of non-deprived population

5.3. Level of Accessibility to Health Facilities

This section provides main finding of the analysis regarding level of accessibility to public health facilities in Cilegon. The analysis is based on walking travel time. Furthermore, there are three types of health facilities considered in this assessment: hospital, primary health center (PHC) and clinics. The evaluation is divided into two categories based on the type of care provided by the health facility: outpatient and inpatient care. The analysis was conducted by calculating number of people SES groups that can be served by each health facility and it was done in ArcMap 10.3 using Network Analyst tool.

5.3.1. Outpatient Care

Outpatient care is defined as medical treatment that does not require an overnight stay in a health facility. There are 23 health facilities that provide outpatient care as well as the basic health services. The health facilities for outpatient care includes 3 hospitals, 15 PHCs and 5 clinics. Figure 5.4. illustrates the level of accessibility to outpatient care. The level of accessibility is divided into 7 classes based on 10 minutes travel time intervals. Lowest level accessibility is earned when the maximum walking time spent to get to health facilities is more than 60 minutes whereas the highest level of accessibility is achieved within 1 – 10 minutes walking time.

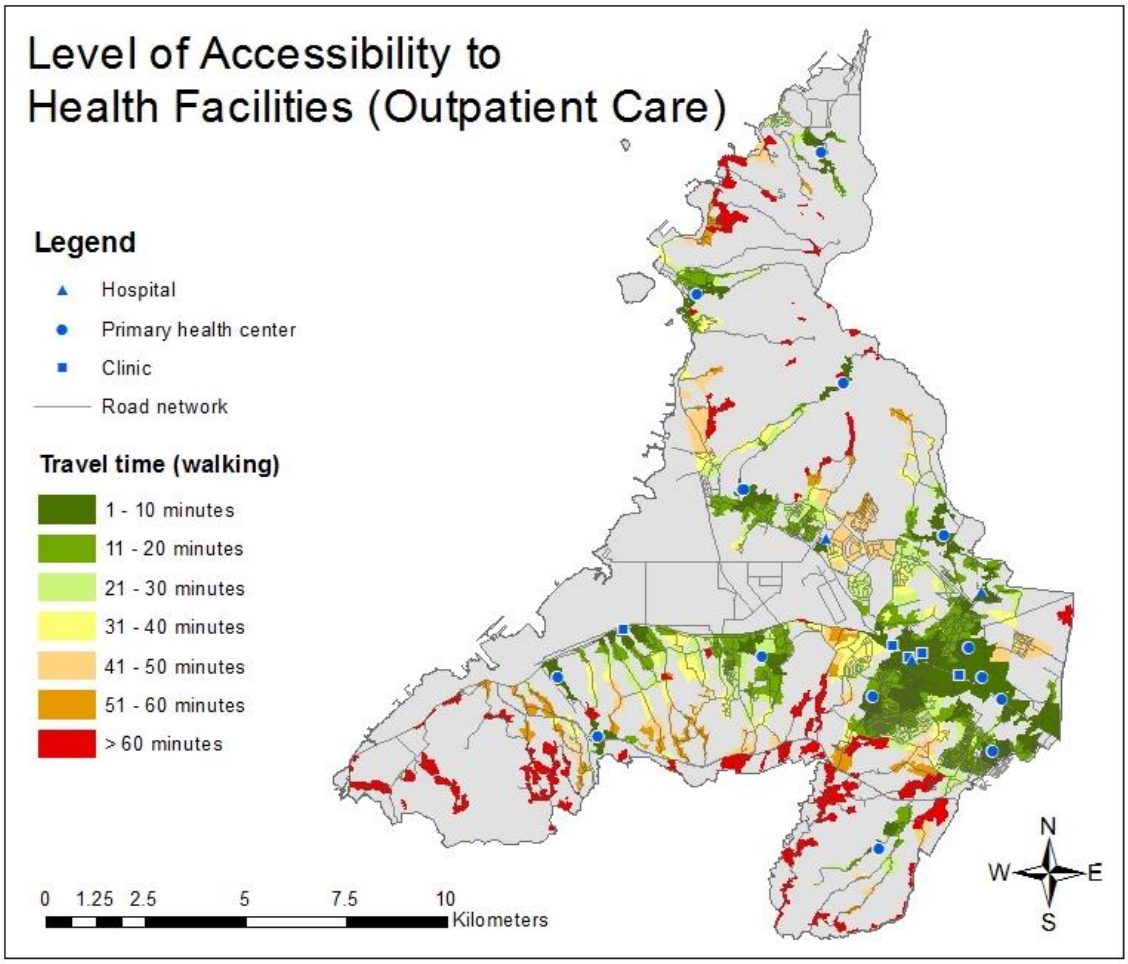

Figure 5.4. Level of accessibility to nearest outpatient care

Table 5.3 presents the time intervals to outpatient care facilities for population across SES groups. Overall, the vulnerable and non-deprived groups gets the best access to outpatient care compared to the other SES group. This is obviously because most of health facilities are concentrated around the center of the city in which many of vulnerable and non-deprived population are distributed. Moreover, the poor and moderately poor group are having similar cumulative percentage for each walking time interval. In the previous section, it has been said that these two groups are mixed together almost evenly throughout the city which made there is no significant difference in the service received from all the health facilities. Meanwhile, the very poor population gets the least physical access among the other groups with almost 25% of them are not covered by the facilities, which means they have to walk more than 60 minutes to get to the health service.

Furthermore, there are 15 PHCs are currently operated in Cilegon. According to government regulation, each PHC should be able to be reached within not more than 3 Km of distance from the place of residence (Ministry of Public Work, 2005). The maximum distance of 3 Km is equivalent to 45 minutes walking time if we assume the average walking speed for pedestrian is 4.5 Km/hour. The walking speed of 4.5 Km/hour is chosen according to several case studies in Indonesia, for example Fauzi (2013) and Tanan (2012) stated that the normal walking speed for Indonesians is about 2,5 mph or equal to 4.5 Km/hour. Although the PHCs are likely to be distributed all over the city, the accessibility level within 41 – 50 minutes to outpatient care is still varies across SES groups with the very poor group still being the most disadvantaged by the service.

Table 5.3. Travel time intervals to outpatient care facilities for population across SES groups

Time Interval	Very Poor		Poor		Moderately Poor		Vulnerable		Non-deprived	
	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)
1-10 minutes	2135	17	3196	20	3337	19	1912	27	82606	24
11-20 minutes	1754	31	3647	42	4025	42	1789	53	103788	54
21-30 minutes	1392	42	2630	59	2900	59	904	66	59235	71
31-40 minutes	1286	52	2020	71	2418	72	1058	81	41620	83
41-50 minutes	1403	63	1871	83	1515	81	451	87	33953	93
51-60 minutes	1162	73	1306	91	1779	91	649	97	22786	99
> 60 minutes	3431	100	1518	100	1540	100	235	100	3080	100
Total	12563		16188		17514		6998		347068	

Number of hospital included in the analysis is three units. Two of them are public hospitals and one is private hospital that accepts the payment using national health insurance. Hospital that accept national health insurance is included because by being the beneficiaries supposed to make the financial access for the population improved. As mentioned in Chapter 3 that there is no official guideline related to maximum distance or travel time in reaching hospital, hence, the threshold is determined chosen based on the research from Amer (2007) regarding patient's travel behavior to health facilities in Dar Es Salaam, Tanzania, that stated most patient are willing to walk to get to health facilities, on condition, they would not walk no more than 30 to 40 minutes. Table 5.3. shows that the very poor group have the worst access to outpatient care in hospital within 40 minutes walking time. This is relevant to the result from spatial variation analysis where this group is concentrated in the southern outskirts of the city whereas the hospitals are situated in the central part of the city where the proportion for population from the other deprived groups are larger. It is also interesting to see that within 40 minutes walking time, the number of vulnerable population that can be served by hospital across SES groups is the highest among all.

Some of the clinics that operated in Cilegon also accepted the national health insurance for the payment, therefore, this research also included these five clinics in the analysis. Threshold set for clinics is 1.5 Km (Ministry of Public Housing, 2005) which is equivalent to 20 minutes walking time. Basically the level of accessibility within 20 minutes walking time is not very good for all the SES groups. In addition, it can be clearly seen from the map (Figure 5.4) there are no clinics that accepted health insurance operated in the northern side of the city. This indicates the deprived population who live in the upper north has a very limited option of health facilities with 2 PHC units and no hospital existed. The cumulative percentage for outpatient care summarized in Figure 5.5.

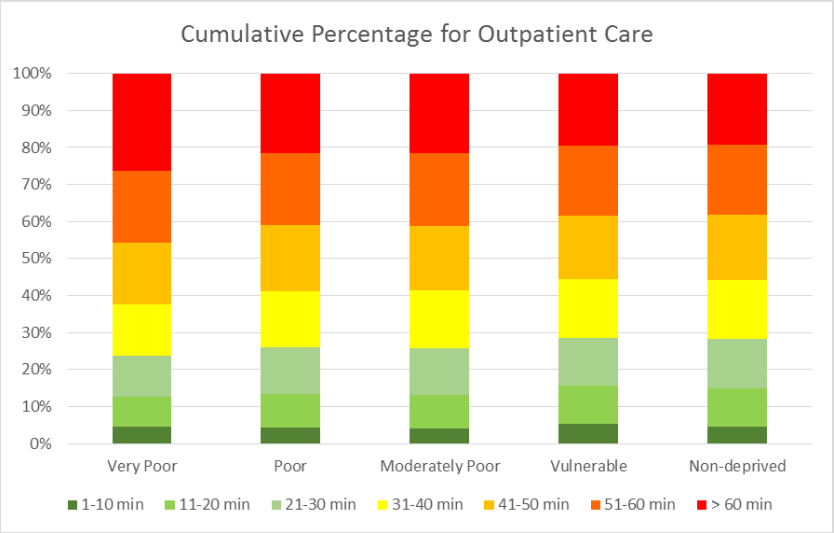

Figure 5.5. Cumulative percentage for outpatient care

5.3.2. Inpatient Care

Inpatient care refers to service for a patient who is formally admitted or hospitalized to a health facility for treatment and stays for a minimum of one night in the facility. In Cilegon, the public health facilities that provides inpatient care includes 3 hospitals and 3 PHCs. Similar with the analysis for outpatient care, the level of accessibility for inpatient care is categorized into 7 classes based on 10 minutes travel time intervals. The map for the level of accessibility to nearest inpatient care in Cilegon is illustrated in Figure 5.6.

In general, it can be summarized that the vulnerable and non-deprived population still gained the best access through all the walking time intervals (Table 5.4). A distinct difference for number of population that can be served by outpatient and inpatient care is, the very poor population gets very limited access if they seek for hospitalization service. There are approximately 70% of the very poor population left underserved as they have to walk more than 60 minutes. In southern and northern part, where the very poor population are mainly concentrated, there are only 1 PHC available in each. Supposed they are required a particular advanced medical treatment in tertiary care, which in the case of Indonesia can only be provided in hospital, consequently, they need to walk farther. Also, the probability to pay extra expenses will be increased because if the walking time is more than 60 minutes then alternative modes of transportation (e.g. motorbike or bus) shoud be considered.

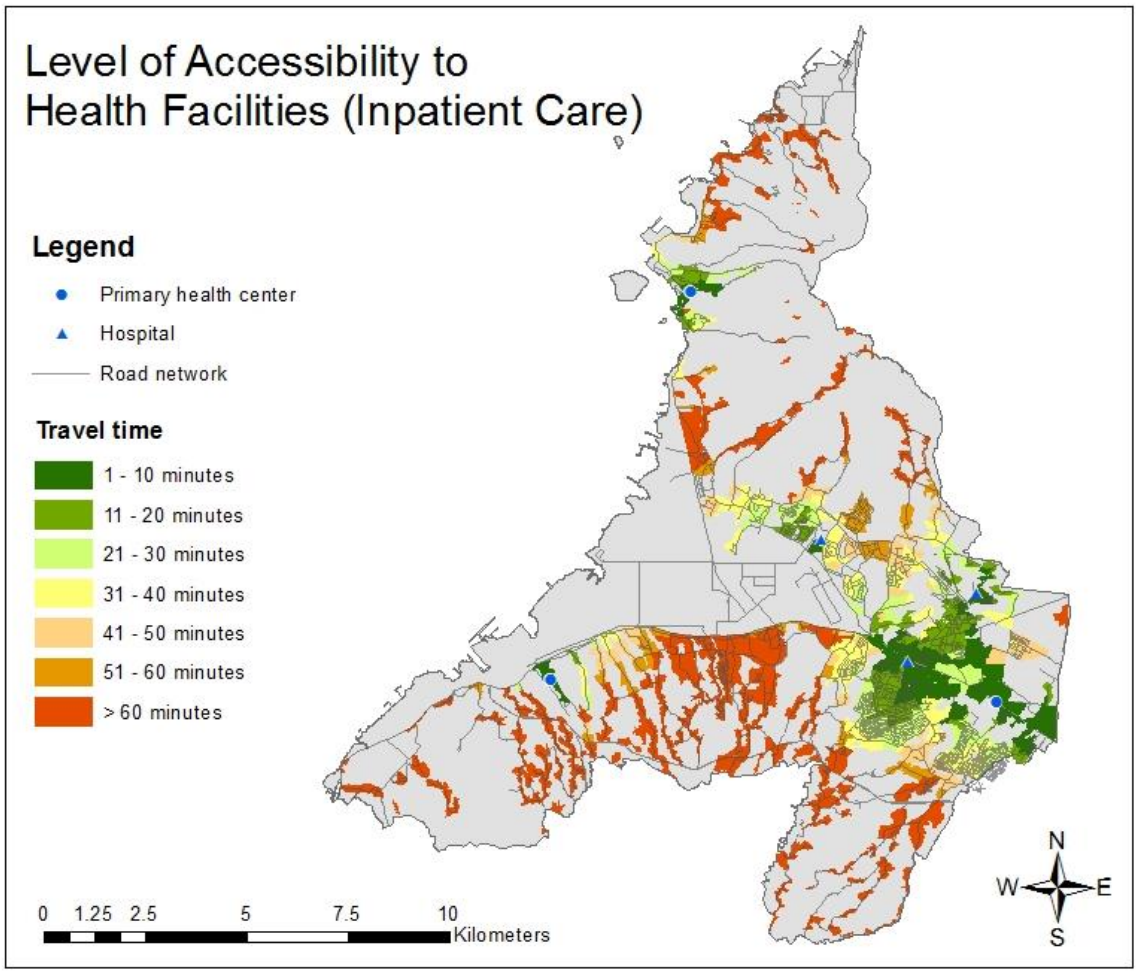

Figure 5.6. Level of accessibility to nearest inpatient care

Within 31 – 40 minutes walking time which is specified for hospital, the result shows the poor, moderately poor and non-deprived population shares similar percentage also the vulnerable slighty obtained higher percentage of population that can be served by inpatient care. Same thing occured within 41-50 minutes walking time, which is the threshold specified for PHC, the very poor have the worst access although actually within 1 – 30 minutes the percentage shows not much of a difference with the other deprived groups. As stated before, number of PHC that provides inpatient care that close to the concentration of very poor population is limited.

Table 5.4. Travel time intervals to inpatient care facilities for population across SES groups

Time Interval	Very Poor		Poor		Moderately Poor		Vulnerable		Non-Deprived	
	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)	Abs	Cum (%)
1-10 minutes	813	6	2014	12	1890	11	1220	17	48838	14
11-20 minutes	530	11	1334	21	1690	20	805	29	43441	27
21-30 minutes	552	15	1693	31	1811	31	795	40	54626	42
31-40 minutes	420	18	1851	43	1973	42	1114	56	59010	59
41-50 minutes	711	24	1651	53	1788	52	748	67	33109	69
51-60 minutes	715	30	1091	60	1167	59	511	47	22316	75
> 60 minutes	8822	100	6554	100	7195	100	1805	100	85728	100
Total	12563		16188		17514		6998		347068	

In summary, looking at the level of accessibility both in outpatient and inpatient care, the very poor group is the most disadvantaged. This may raise an issue regarding the inequality because it is very obvious that compared to the very poor population, the non-deprived population gets better physical access to health facilities. In addition, the as the SES get higher the population tend to live closer to the city center where most health facilities are located. The cumulative percentage for inpatient care summarized in Figure 5.7.

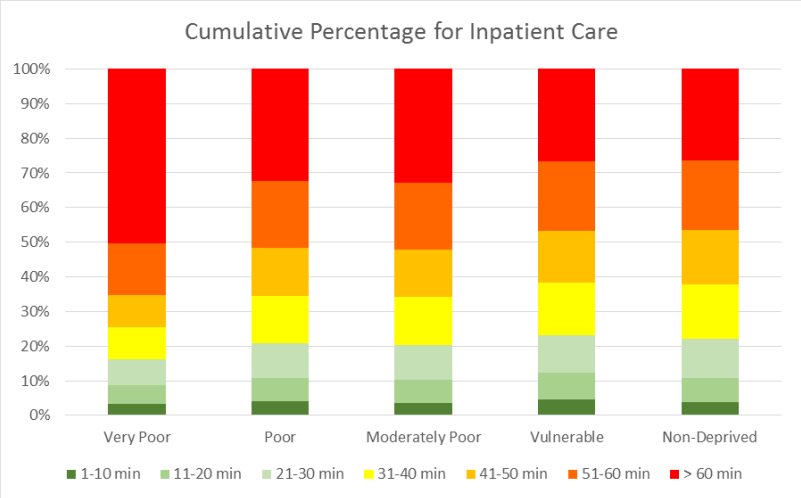

Figure 5.7. Cumulative percentage for inpatient care

5.4. Discussion

5.4.1. Using Household Survey Data to Determine SES Groups

Following the SES variables distribution across the deprived population which is explained in the frequency analysis, in some variables the very poor group has better condition compared to more better-off households. Based on this evidence, this research raised two possibility of errors that occured in the dataset Cilegon. First is when BPS conducted the data collection and for this particular issue, a discussion was conducted with the staff from Cilegon government to ensure what actually happened in the field. Second is related to the data updating that Cilegon government have done twice in 2012 and 2013.

There are many surveyors involved in PPLS progamme and each of them probably do not have same quality and knowledge to interpret the questions listed in the questionnaire although they were trained before. For example, one household may have more than one answer to a particular variable such as having several options on fuel for cooking, meanwhile, surveyor can only retained one answer listed in predefined categories. Which one that surveyor choose as an answer will make a difference in a data record, the inconsistency showed in the frequency analysis where the high rate in using of gas for cooking is complemented by very low possession rate of gas tube. In other case the surveyor might not delivered deeper question about a particular variable, suppose they saw motocycle parked in one house then asked the household's head, "is this your motorcycle?" and the household's head might answer, "yes, that is mine". If the question stopped at this point and the surveyor fill in the questionnaire as having a motorcycle, this may produce wrong record because there is a chance that the motorcycle is rented or it is only temporary facility that the employer lend out for work purpose. The other case is when the door-to-door survey was carried out, the household's head was absent because of some reasons and the surveyor must interview other household's member, consequently the inaccurate record can be existed.

The second error might occured because of data updating. Cilegon government received the PPLS database for deprived population at the end of 2011. For the local government's intervention purpose the data is

updated every once in a year to check the latest condition of the citizens meanwhile dataset used for this research is from 2013. This updating must be done because according to the government of Cilegon, there are some programs such as house renovation assistance programme that has been implemented in between year 2011-2013 and it is intended only to the very poor group. Exclusively for the very poor group, although the condition of the house has gotten better after the renovation assistance which supposed to be increase the household status, but at the end it did not change the SES category because the government believe better house does not guarantee that population in that group will be able to live well in future considering many of them still unemployed and a small average monthly income. In addition, several records of deprived households not being updated in terms of SES category because the government is also taking into account the household that have a disabled or a very ill member. This can explain why in some variables, the condition is better in a poorer households than in more affluent households.

Apart from errors that occured during the data collection and data updating problem, looking at the SES characteristics result, several impact might happen as well when it comes to the implementation of PPLS dataset as an input to determine the social protection programme beneficiaries. Suppose the government want to improve the access to safe drinking water in attempt to increase the quality of life in deprived groups through some interventions. Since it is found that the relationship between access to water and SES categorization is very low, hence, the effort to improve quality of life will not likely to have significant effect. On the other hand, Nazara and Rahayu (2013) stated that the implementation of PPLS programme in 2011 have brought an improvement for social protection programme established by the central government. For example, there is an increasing in the number of beneficiaries around 16% for Family Hope Programme (PKH) after using the input database from PPLS. PKH is a programme that provides cash to very poor households to improve the access to health facilities, especially for maternal care, and to increase the school participation for the children. Based on this evidence, it can be said that the PMT modelling as well as the development in data collection method embedded in PPLS programme is apparently appropriate to indicate the deprived population in Indonesia.

However, related to this research, the SES variables that should be used are better to follow the results of statistical tests so that the result of analysis will become more systematic and relevant. Because it turned out the results from statistical tests showed that the variables that have a significant relationship with the categorization of SES are actually the variables that are commonly used in previous studies (refer to Table 2.1). Furthermore, although this research specifically seeks the linkage between SES and health service delivery, health variables in a dataset PPLS should not be included because apparently the health information does not give meaningful insight to the analysis. The fact that Cilegon government has done the updating which involved their own perception in selecting deprived population and in turn locked some of the records to be not modified, it may cause the inconsistency within the dataset, means the result of PPLS is no longer based on the PMT modelling.

For future research that need to use PPLS dataset as an input, it will be better to remove variables that do not have significant evidence of relationship with SES categorization. By using the appropriate variables, another type of statistical analysis such as cluster analysis can be done to generate the new SES categories which is based on similarities and dissimilatities within and between clusters, making each clusters has distinct characteristics that represents the condition of population belong to a particular SES group. Eventually, the level of accessibility to health facilities across SES group will also generate different result which possibly more accurate.

5.4.2. Accessibility

One of important findings from the accessibility analysis is that population in the very poor population experienced the worst service coverage for both outpatient and inpatient care compared to the other deprived groups. Meanwhile, poor and moderately poor population shares a similar percentage in terms of number population that can be served by health facilities because they are populated adjacent to each other. As for the vulnerable population, they gained the best access to all type of care considering among the other deprived population they have the least underserved population. Similar with the vulnerable population, the non-deprived is the most favored.

There are two issues need to be addressed regarding the distribution of health facilities in Cilegon. First is the location of PHC. Table 5.3. presents the PHC service ratio in district level. It can be identified from the table that the PHC is not equally distributed. Jombang, Cilegon and Citangkil districts are adjacent to each other, hence, it is logic that although Citangkil and Cilegon are only have 1 PHC, the population still being provided with good access and more than 80% are covered. Purwakarta district has also 1 PHC available and has to serve 39,392 inhabitants. This makes the percentage of served population is the smallest than the served ones because of the limited choice for population in reaching PHC. The interesting finding is that there are more than 1 PHC available in the northern and southern part of the city (Grogol, Pulomerak and Ciwandan) however the percentage of underserved population is much larger than the served population. This could be an impact of insufficient infrastucture such as the road network. It can be seen from the road network map in which it very dense in the center part and more sparse in the north and south.

Next is the clinics which is originally there are 25 units existed but since this research only considered the ones that accept national health insurance for payment therefore only 5 units are obtained. Four of them located in the center and one in the south. The presence of health insurance should be able to facilitate the deprived population in accessing health facilities. However, according to the spatial dataset obtained for this research, those clinics that accept payment by insurance are primarily located in the city center while the deprived population are more distributed in the north and south. This evidence can be a recommendation to government or stakeholders that if the main objective of insurance is to provide service for the poor and achieve better health for everyone, then the clinics that accept insurance payments should have been located in the areas where the poor are concentrated.

Table 5.5. PHC service ratio in district level

District	Number of PHC	Population	Ratio	Level of Accessibility	
				Served (%)	Underserved (%)
Jombang	2	63919	31960	76.5	23.5
Cilegon	1	42040	42040	82.1	17.9
Pulomerak	2	44966	22483	37	63
Citangkil	1	64192	64192	81	19
Purwakarta	1	39492	39492	39.3	60.7
Grogol	3	41579	13860	55.7	44.3
Cibeber	3	38673	13476	74.15	25.85
Ciwandan	2	45232	22616	34.2	65.8

5.4.3. Discussion on Health Policy in Indonesia

According to the minimum service service standards established by the Ministry of Public Work and Ministry of Health (see Table 3.1., there are four indicators that relevant to this research. First is the service scope which refers to availability of health facilities in one administrative level. In municipality level, there should be at least public hospital and to date Cilegon is already own two public hospitals. Meanwhile, there should be at least one PHC in district level. Cilegon has fulfilled this standards by having at least one in each district and apparently there are some districts that have more than 1 PHC. However, according to level of accessibility table, Ciwandan and Pulomerak seemed to have many population from the very poor group that are underserved by PHC. It is stated before in previous section, low coverage level might be an impact from the lack of road network. There is no empirical evidence that can support this statement, but since the calculation of service area is done by using road network as an input, thus it might be suspected that in northern part the low level of service of public health facilities is an impact of inadequate network.

The next standards to be disucssed is regarding the service level and the location which focus on maximum distance from settlements to health facilities. For the location, Ministry of Public Housing specified threshold for PHC and clinics, but mostly, the government regulation does not specify the maximum distance to public hospital because number of the unit required for a city is usually very limited with greater advanced service for each unit. It is stated that one hospital should cover minimum 240.000 people. The actual total population in Cilegon in 2013 is 393.147 and a hospital is operated at a municipality level, thus, in general the existing ratio between hospital with population is approximately 131.049. It means the minimum ratio is already achieved from this perspective. However, if the road network with the threshold of 40 minutes walking time is considered, apparently there is no hospital that could cover up to 240.000 people (Figure 5.8).

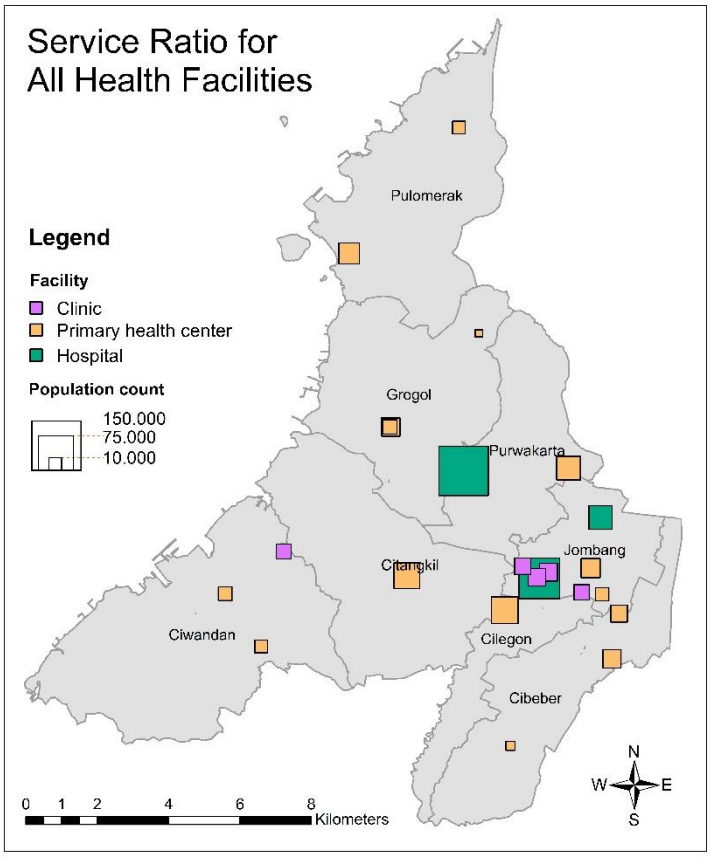

Figure 5.8. Service ratio for health facilities in Cilegon

On the other hand, one of criterias designed for PHC is that one facilities must support at least 120.000 people. Compared to the total population, rationally, 15 PHCs should be sufficient to accommodate all the population in Cilegon. But then again, according to government regulation each PHC should be reached within not more than 3 Km (45 minutes) and it should accommodate the population even in a condition with no means of transportation. It can be seen from the map in Figure 5.8., the maximum population that can be covered by one PHC is limited up to 75.000 people. Striking result is coming from clinics in which government specified the minimum ratio of 1:5000 and maximum distance of 1,5 Km (20 minutes). Apparently, clinics could served more than required which is up to 10.000 people. Based on this evidence, the minimum service standard regarding minimum ratio and location is not completely relevant when it comes to considering walking time along the road network. Further research should be conducted to investigate the capacity of each health facility to be able to review the existing minimum service standards established by the government.

Last indicator is the operation hour. Daily operation hour for hospital and PHC are the same with all government institution's office hour which is between 07:30 – 17:00 from Monday to Thursday and 07:30 – 16:30 on Friday. In addition, it is mandatory for hospital to have an emergency unit which operated 24 hours, this makes the level accessibility to inpatient and outpatient care in hospital is not restricted by time because it could deliver a service anytime in a day. For PHC, particularly the outpatient care, is actually not all the unit operates on Saturday and Sunday because the government regulation does not obliged this matter, however, according to Cilegon government report there are some PHC that operates on Saturday and usually they only open for a half day (08:00 – 11:00). In the case of clinics, the operation hour is not specified by the regulation since clinics are basically a private practice where the operation hour is determined by the medical doctor who operates the clinic, hence, accessibility to clinics will likely to be limited by time.

6. CONCLUSION

This chapter is divided into ttwo sections. Section one summarizes the key findings based on what is proposed in the research objective. Furthermore, the next section explains the limitation of this research as well as the recommendations for possible future research.

6.1. Conclusion

This study primarily concern with SES and the accessibility to public health facilities using Cilegon as a case study. To achieve the main objective of the research, three specific objectives were proposed along with list of research questions. The following subsection draws the key findings of this research in order to achieve the main objective.

6.1.1. Key Findings from Specific Objective 1

Overview on SES indicators shows that the indicators of SES vary depending on the research purpose and data availability. PPLS 2011 programme collected data on housing features, durable assets and other demographic characteristics (occupation, average monthly income, education level, etc.) as the variables to predict the per capita expenditure which underlies the categorization for deprived population. However, the statistical result shows that housing features and asset variables are more associated with SES compared to demographic characteristics variable. In other words, not all variables can be a good representative to explain the characteristics of each deprived group. The interesting finding appeared when analyzing the frequency distribution, for some variables, the very poor group in certain cases has better living condition compared to the less deprived households. This indicates SES categorization embedded in the current PPLS dataset used in this research is not always consistent.

The spatial distribution of very poor group is mostly concentrated in northern and southern part of the city, which is in Grogol and Ciwandan district. Both districts are near to industrial area and the city border area. The poor group is more concentrated in the western side of the city centre and the rest are mixed together along with the population from moderately poor and vulnerable group. The moderately poor group is the largest group and many are located in Ciwandan district which is in same location where the very poor group is concentrated. This indicates that Ciwandan has more deprived population compared to the other districts. As for vulnerable group, they are mostly resided in the southern side of Citangkil district, close to the city center where the non-deprived population primarily concentrated. It can be summarized that as the SES get higher the population tend to live closer to the city centre area.

6.1.2. Key Findings from Specific Objective 2

Population in the very poor group experiences the worst service coverage for both outpatient and inpatient care compared to the other deprived groups. Meanwhile, poor and moderately poor population shares a similar percentage in terms of number population that can be served by health facilities because they are living close to each other within the city. As for the vulnerable population, they gained the best access to all types of care, whereas, the non-deprived is the most favored by health service. This may lead to the inequality issue which can be investigated more detailed for the future research.

In addition, two issues were identified regarding the distribution of health facilities in Cilegon. First is the location of PHC which is not equally distributed within the city. Jombang, Cilegon and Citangkil districts are adjacent to each other, thus, although in Citangkil and Cilegon only 1 PHC available the population still

covered relatively good by the health service. Purwakarta district has also 1 PHC but the proportion for underserved population is larger than the served one because the population have limited option in accessing PHC. The interesting part is that in north and south part there are more than 1 PHC available, however, the PHCs are still not able to accommodate the population. This could be an impact of insufficient infrastucture such as the road network because the networks are more sparse in the north and south and very dense in the center part. Second issue is the location for clinics. Number of 5 units of clinics that accept payment using national health insurance are mostly distributed in the city center. This evidence can be a recommendation to government or stakeholders. For example, if the main objective of national health insurance is to accommodate the deprived population in accessing the health facilities and achieve better health status for all population, then the clinics that accept insurance payments should have been located in the areas where the poor are concentrated.

6.1.3. Key Findings from Specific Objective 3

According to the minimum service standards established by the Ministry of Health there are four indicators that relevant to this research: service scope, service level, operation hours and location. Cilegon has fulfilled service scope by having at least one hospital in the city center and one PHC in each district. Next is the standard regarding minimum ratio and location. Regarding the operation hours, in the case of clinics this is not specified in a regulation since but one important knowledge that can be obtained from this evidence is the accessibility to clinics will likely to be limited by time, unlike the PHC that have eight hours of daily service and 24 hours emergency unit in the case of hospital.

Lastly, it is explained that one hospital should cover minimum 240.000 people. By considering the road network combined with the threshold of 40 minutes walking time, the result shows there is no hospital in Cilegon that could cover up to 240.000 people. Moreover, one PHC must support at least 120.000 people and each PHC should be reached within not more than 3 Km (45 minutes). The result shows the maximum population that can be covered by one PHC is limited up to 75.000 people. Also, apparently clinics could served more than required by the government regulation. However, this result might not very relevant since it it would be more realistic if it is compared with the condition of service capacity in each facility. Further research should be conducted to be able to review the existing minimum service standards, particularly in minimum ratio, established by the government.

6.2. Recommendations

Several limitations was found while conducting this research that can be solved by further research. It is explained in two main points as follow.

- *Data*

PPLS 2011 programme does not collect data on SES variables from non-deprived population, thus, the key finding of this research is more relevant for explaining the condition in deprived population. Moreover, there is no information regarding total population in RT level which make the estimation process need to be done. To encounter this problem, a field work and primary data collection is highly recommended. Besides, it is also able to produce a more comprehensive analysis, for example, by comparing the result generated from existing data given from the local government with primary data collection and check whether those two are consistent. An in-depth interview to institution related to the development of PPLS 2011 programme would also give the analysis more added value because in this research the operation of PMT modelling in creating SES categorization is unknown, therefore, it is hard to judge whether the method is actually appropriate or not.

- *Analytical methods*

A Chi-square independence test only provide the evidende of relationship between two variables. Another statistical analysis can be done to figure out to what degree SES variables have a relationship with SES categorization, for example the regression analysis. Additionally, custer analysis can be performed to stratify the variables that proved to have strong relationship with SES categorization into several classes. Next suggestion is regarding the method of measuring the level of accessibility, choices of the public transportation modes can be included into analysis since it will provide richer analysis that possibly closer to real condition of population in reaching health facilities.

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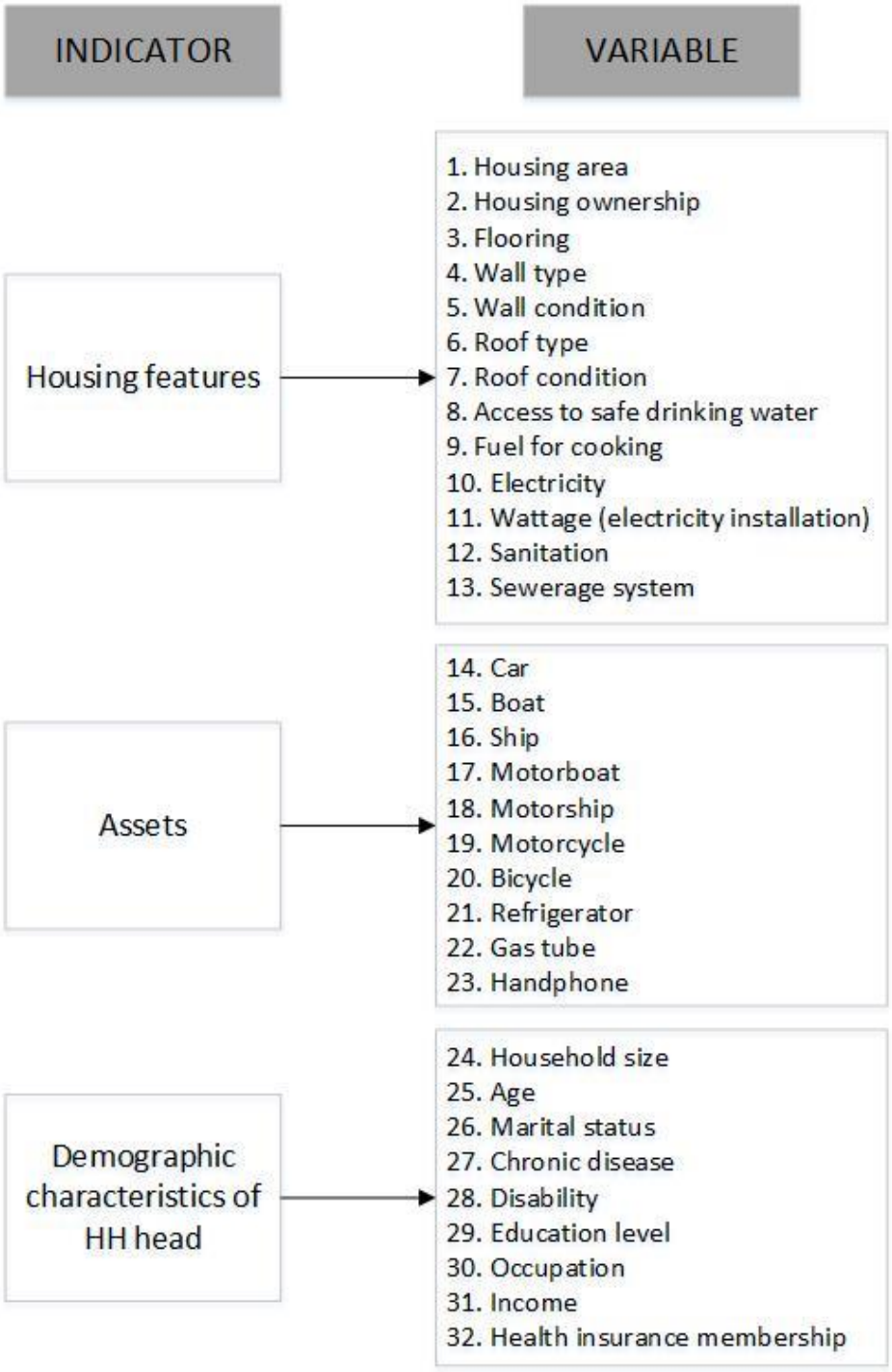
APPENDIX 1 - PPLS DATASET ATTRIBUTES



APPENDIX 2 – HOUSEHOLD CHARACTERISTICS TABLE

Key Indicators	Categorical Variables	Deprived Groups (%)				Chi-square Independence Test		
		VP	P	MP	V	Chi-square	Sig.	Cramer's V
		23.60%	30.50%	32.80%	13.20%			
Housing features	**Housing area (m2)**	Mean = 70.11	Mean= 76.04	Mean= 78.75	Mean= 93.05	373.54	.023	.298
	Housing ownership					32.408	.006	.088
	Private	80.1	80.9	80.6	79			
	Non-private (rent, owned by public/relatives, free of use, other)	19.9	19.1	19.4	21			
	Flooring					330.162	.000	.280
	Tile/wooden	11.7	25	42.5	77.2			
	Non-tile (soil, bamboo, cement)	88.3	75	57.5	22.8			
	Wall type					57.019	.000	.143
	Brick	85.7	92.7	91.8	96.9			
	Non-brick (bamboo, wood)	14.3	7.3	8.2	3.1			
	Wall condition					495.117	.000	.594
	Good	4.1	7.5	12.7	68.1			
	Bad	95.9	92.5	87.3	31.9			
	Roof type					23.322	.078	.074
	Clay	91.9	93.6	92.7	92.6			
	Non-clay (haystack, asbestos, zync, wood, concrete)	8.1	6.4	7.3	7.4			
	Roof condition					385.151	.000	.524
	Good	3.3	5.6	10.3	59.8			
	Bad	96.7	94.4	89.7	40.2			
	Drinking water source					144.782	.000	.190
	Improved source (well, tap, protected spring)	51.8	46.6	39.3	30.9			
	Unimproved source (vendor, unprotected spring)	48.2	53.4	60.7	69.1			
	Water Acquisition					107.895	.000	.277
	Purchase	24	37.1	46	65.2			
	Free	76	62.9	54	34.8			

Key Indicators	Categorical Variables	Deprived Groups (%)				Chi-square Independence Test		
		VP	P	MP	V	Chi-square	Sig.	Cramer's V
		23.6%	30.5%	32.8%	13.2%			
Housing features	**Electricity**					27.762	.001	.142
	PLN	95.8	98.9	98.1	99.3			
	Non-PLN	4.2	1.1	1.9	0.7			
	Wattage					14.208	.003	.101
	Yes	96.4	99.3	98.5	99.8			
	No	3.6	0.7	1.5	0.2			
	Fuel for cooking					363.329	.000	.360
	Gas	24.3	60.7	82.7	92.7			
	Non-gas (wood, bricket, oil)	75.7	39.3	17.3	7.3			
	Sanitation					933.363	.000	.577
	Private	0.6	99.8	65.8	95.3			
	Communal	15.8	0	7.6	0.8			
	None	83.6	0.2	26.6	3.9			
	Sanitary landfills					484.502	.000	.588
	SPAL	10.5	82.3	57.6	81.6			
	Non-SPAL	89.5	17.7	42.4	18.4			
Assets	**Car**					10.449	.015	.086
	Yes	0	0	0.7	1			
	No	100	100	99.3	99			
	Boat					6.698	.082	.069
	Yes	0	0.1	0.8	0.9			
	No	100	99.9	99.2	99.1			
	Ship					6.44	.092	.066
	Yes	0.1	0.1	0.9	0.9			
	No	99.9	99.9	99.1	99.1			
	Motorboat					3.757	.289	.052
	Yes	0	0	0.3	0.2			
	No	100	100	99.7	99.8			
	Motorship					5.999	.112	.065
	Yes	0.2	0.1	1.6	1.7			
	No	99.8	99.9	98.4	98.3			
	Motorcycle					536.176	.000	.618
	Yes	10.8	6.5	64.3	64.7			
	No	89.2	93.5	35.7	35.3			
	Bike					77.32	.000	.235
	Yes	2.9	1.7	15.1	15			
	No	97.1	98.3	84.9	85			
	Refrigerator					343.887	.000	.495
	Yes	1.8	1.6	30.8	52.8			
	No	98.2	98.4	69.2	47.2			

Key Indicators	Categorical Variables	Deprived Groups (%)				Chi-square Independence Test		
		VP	P	MP	V	Chi-square	Sig.	Cramer's V
		23.6	30.5	32.8	13.2			
Assets	**Gas tube**					55.153	.000	.198
	Yes	0.8	0.5	10.2	6.8			
	No	99.2	99.5	89.8	93.2			
	HP					212.164	.000	.389
	Yes	34.4	42.2	70.9	80.4			
	No	65.6	57.8	29.1	19.6			
Demographic characteristics	**HH size**	Mean= 3.47	Mean= 3.36	Mean= 4.29	Mean= 4.19	155.781	.000	.192
	Age					46.077	.000	.128
	< 17	0.1	1.3	1	0.8			
	17 - 59	70.1	60.2	75.6	80.3			
	> 60	28.8	38.5	23.4	18.9			
	Marital Status					58.211	.000	.144
	Divorce	38	43.2	26.9	23.8			
	Married	60.9	55	72.1	74.7			
	Single	1.2	1.8	1	1.6			
	Chronic disease					62.25	.000	.125
	Healthy	82.6	79.5	86.6	90.5			
	Unhealthy (asthma, cancer, diabetes, heart disease, hypertension, rheumatic, stroke, TBC)	17.4	20.5	13.4	9.5			
	Disability					33.174	.044	.089
	Healthy	95.3	94.4	97.4	98.3			
	Disabled (blind, deaf, speech impairment, multiple disability, mental disability)	4.8	5.5	2.6	1.9			
	Education level					116.378	.000	.180
	Primary school	50.4	46.5	49.8	37.6			
	Middle school	6.5	10.2	13.1	24.8			
	High school	2	5.1	6	15.4			
	Higher education	0.1	0.2	0.3	0.8			
	No education	40.9	38	30.9	21.4			

Key Indicators	Categorical Variables	Deprived Groups (%)				Chi-square Independence Test		
		VP	P	MP	V	Chi-square	Sig.	Cramer's V
		23.60	30.50	32.80	13.20			
Demographic characteristics	**Employment Status**					74.295	.000	.163
	No	30.3	39.1	22.8	17.3			
	Temporarily unemployed	6.1	5.3	5.7	5.4			
	Yes	63.6	55.6	71.5	77.3			
	Income					151.572	.000	.228
	< 500	44	48.5	31.4	19.2			
	500 - 750	33.7	32.7	32.6	22.3			
	750 - 1000	17.2	13.2	23.3	20.1			
	1000 - 1500	4.2	4.4	10.3	22.6			
	1500 -2000	0.7	1.1	2	9.8			
	> 2000	0.2	0.2	0.4	5.9			
	Health insurance					5.346	.148	.062
	No	11.9	16.1	14.1	16.1			
	Yes	88.1	83.9	85.9	83.9			