Analysis of the relationship between socioeconomic position and public services provision. An inter-village analysis of the province of Yogyakarta, Indonesia.

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Analysis of the relationship between socioeconomic position and public services provision. An inter-village analysis of the province of Yogyakarta.

by

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Abstract

In the provision of health care and education, certain aspects are mostly overlooked. These aspects include the non-inclusion of the spatial component in the distribution of public services, the non-use of aggregate level indicators (since the coverage of services go beyond households) and the fewer number of studies on the association between socioeconomic position (SEP) and the provision of public services.

This study therefore sought to identify a spatial approach to analyse if the socioeconomic position of an area has any association with the provision of public services. In order to achieve this objective, the study first assessed the level of provision of health care and education. The socioeconomic position of villages was also assessed. The study finally analysed the relationship between the socioeconomic position of the villages and the level of health care and education.

The study analysed the variations among villages in the province of Yogyakarta, Indonesia. The study was exclusively on secondary data. Use was made of an extensive dataset from the population census 2000 and some aspects of that of 1993 and 1996 censuses. Statistical and spatial techniques were used in the analyses. Indicators of health care and education as well as SEP were analysed with a combination of correlations and descriptive statistics. Indices were developed for analysing health care provision across the province and SEP with the use of principal component analysis (PCA).

The results showed that the provision of health care in terms of the number of persons sharing a health facility was low for all the villages within the city of Yogyakarta as compared to other municipalities. The city however has many specialist hospitals, maternity hospitals, polyclinics, etc and may therefore not necessarily have low capacity or insufficient health facilities. The congested nature of health facilities in the villages within the city may also be attributed to the assumption of equal capacity of health facilities which may not be so in real life. Villages having more people per health centers were realized to be within 4km of these facilities whereas those with fewer people were farther away. Villages with lower levels of health care provision were spatially clustered. From the dataset, asset and welfare related indicators showed more variation. Villages in the eastern and western parts were mostly of lower SEPs. These villages also showed some amount of spatial clustering. Upon relating SEP and provision of health care, the villages of lower SEPs were seen to be far from health facilities as compared to those villages of higher SEPs. This was attributed to the less dense population in those villages. On the other hand, the number of people per primary school was less for the lower SEPs. The higher socioeconomic positions had more people per primary school.

The study realises that areas of higher socioeconomic position and the lower socioeconomic positions encounter variations in terms of services provision. Interventions are necessary to ameliorate this situation.

Keywords: Equity, socioeconomic position, health care provision, education provision, spatial analysis.

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Finally, I dedicate this work to my parents; Mr. & Mrs. Amoah, my sisters; Jennifer, Olivia, and Alberta and to my brothers; Kofi and Paa Kwasi. I love you all so much!

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List of Acronyms

BPS	Formerly Biro Pusat Statistik, now Badan Pusat Statistik
BSN	Badan Standardisasi Nasional
DI Yogyakarta	Daerah Istimewa Yogyakarta (Special Region of Yogyakarta)
DIY	Dista Yogyakarta
GDP	Gross Domestic Product
GIS	Geographic Information System
GRDP	Gross Regional Domestic Product
ILD	Index of Local Deprivation
IMD	Index of Multiple Deprivations
MOST-UNESCO	Management of Social Transformations Programme - United Nations Educational Scientific and Cultural Organization
NZDep	New Zealand Index of Deprivation
OECD	Organisation for Economic Co-operation and Development
OED-ADB	Operations Evaluation Department - Asian Development Bank
PCA	Principal Component Analysis
PREST/CRIC	Centre for Science and Technology Policy and Management Research of Manchester Business School/ ESRC Centre for Research on Innovation and Competition
PUSTRAL – UGM	Center for Transportation and Logistics Studies in Gadjah Mada University
RT	Rukun Tetannga (Below neighbourhood Unit)
RW	Rukun Warga (Neighbourhood Unit)
SEAR	WHO Southeast Asian Regional Office of World health care Organisation
SEP	Socioeconomic Position
SES	Socioeconomic Status
SIMD	Scottish Index of Multiple Deprivations
SNI	Standar Nasional Indonesia (Indonesian National Standard)
SPSS	Statistical Package for Social Sciences
UK-ONS	United Kingdom Office of National Statistics
UNDP	United Nations Development Program
UNEP/RIVN	United Nations Environmental Programme/ Rijksinstituut voor Volksgezondheid en Milieu (National Institute of Public Health care and Environment)

1. Introduction

1.1. Introduction

This chapter sets the basis for the entire research. It incorporates the general framework of the study; the aims and objectives and the background of the study. The initial part is a broad overview of the research focus which is further elaborated upon in subsequent chapters. The proceeding section deals with the specific objectives and research questions followed by the general methodology, design and conceptual framework. The chapter is concluded with a summary of the remaining outline of the thesis.

1.2. Background

Variations in the provision of public services are amongst the most challenging issues facing nations today. Discussions and debates about these phenomena have led to a wide body of literature on public services in terms of variations in the nature of distribution (Harvey 1973; Smith 1994). In the distribution of services, care is needed to prevent certain groups of people from having more to the detriment of those to whom the services are most needed. Studies have shown that people have various capacities and possess different abilities to command resources or services (Harvey 1973; Walter, D'ambrosio et al. 2004). This situation has mostly left those with minimum capacities being unable to command sufficient services (Robert 1999). "*The best facilities almost always end up in places with the least need for these facilities* (Hart 1971:412 as stated in Benson 2001)." This is because persons in such areas are largely successful in their attempts to influence the distribution system.

Studies on variations in public services date back to the 1800's with the likes of David Ricardo and Karl Marx. Such early writers with their theories on communism write on direct democracy wherein sovereignty is lodged in the citizenry as against selected few. These writers from the very onset write on what would have been an ideal world where everybody has a say on issues affecting their welfare. Modern writers since then have elaborated on these theories to encompass justice in the distribution of public services (Brandt 1962; Harvey 1973; Walster and Walster 1975; Smith 1994). Justice is seen as a paramount decisive factor in service distribution and various authors have described variations of this phenomenon as justice of need, equity, parity and laws (Brandt 1962; Davis and Whinston 1962). Others have simply termed it as social justice (Harvey 1973; Walster and Walster 1975; Smith 1994). In all these terms, the principle is virtually the same; that people are covered by public services irrespective of their societal position. This is to say that services should be distributed according to social need, social merit, population, areal and burden-benefit or some other combination that exhibit fairness (Marsh and Schilling 1994). The inequitable nature of the distribution of services in mostly developing countries has been noted by the United Nations Development Program (UNDP).

"...Many countries continue to focus resources and opportunities on those already privileged. Across a range of countries, public health care and education spending is routinely concentrated on providing services for the better-off, reinforcing the divide. By the principles of rights, it is imperative

to re-orient resources towards the marginalized so that long-standing and systematic discrimination is overcome (UNDP 2000: 96)."

Discriminatory distribution of services is as a result of the capacity of certain groups of people to command more of public services even when other groups do not have them. By Articles 21, 25 and 26 of the fundamental human rights of the United Nations, everyone is entitled to services such as education and health care irrespective of status. Though these laws are not binding, Indonesia's Constitution (Amendment) 1945 as a form of solidarity, reiterate those of the United Nations. Article 28(E&H) of the Indonesian Constitution provides the rights to physical and spiritual prosperity as well as the right to enjoy medical care and education. Therefore, the government is obliged to ensure sufficient public service facilities to all [Article 34(3)]. Equitable enjoyment of services can be ensured through minimization of spatial variation in service provision. This also ensures that irrespective of the capacities of people, what is due them is given to them.

A relatively new dimension of measuring variations in public service and the capacity of people to use these services is through the strategic use of Geographic Information Systems and statistical techniques. Geographic Information System (GIS) is rapidly gaining foot in spatial analysis for its ability to store, analyse, edit, integrate, manipulate and display data linked to locations (Anselin, Syabri et al. 2006; Steiniger and Bocher 2009; Steiniger and Weibel 2009). GIS tools have the ability to incorporate measures or indicators that show spatial variations in public services provision.

1.3. Justification

This study is necessary in the light of three main reasons. Studies that consider the spatial extent of public services are scanty (Odoi, Wray et al. 2005). Many studies do not look into the spatial characteristics of the distribution of public services. This study looks into the spatial characteristics of the distribution of public services.

The second reason is based on the use of community indicators instead of the more popular individual/household-level indicators. Studies have shown that the use of individual or household indicators for measuring variations in the provision of health care and education is not ideal. This is because for health care and education, the area of service tend to go beyond individuals and households into the bigger community area (Kirby and Kaneda 2005; Odoi, Wray et al. 2005; Kirby and Kaneda 2006). These studies also indicate the unavailability of requisite information at a more disaggregated level such as the household or individual level which tends to overestimate or underestimate results.

The third reason for undertaking this research and in particular targeting public services like education and health care is because such services are able to stabilize market conditions and supply services that are unprofitable to private providers. Adnett (2004) writes on educational trends in OECD countries and policies that have encouraged privatisation of state education in these countries. He argues that an increase in private provision will be to the detriment of low-income groups as private schools are not conscious or desirous of achieving equity. They tend to consider cost efficiency; how best they can cut down operational cost. This argument is supported by Hart (2003).

The above reasons demonstrate the essence of undertaking this study. The next section elaborates on the phenomenon and the dimension for which the study will take to assess the phenomenon.

1.4. Research problem

Spatial analysis is an emerging field which is useful in studies on variations in public services (Odoi, Wray et al. 2005; Pearce, Witten et al. 2006) though seldom employed. The selection of Yogyakarta, the study area, is based on deductions made from SEAR - WHO (2008) that spatial variation in the provision of public services is a problem in Indonesia. From this report, even though significant improvements have been made in the light of minimizing this phenomenon, areas with people of fewer capacities seem to be lagging behind. Services tend to be located in places where they are least needed. The distribution of these services is unequal and discriminatory.

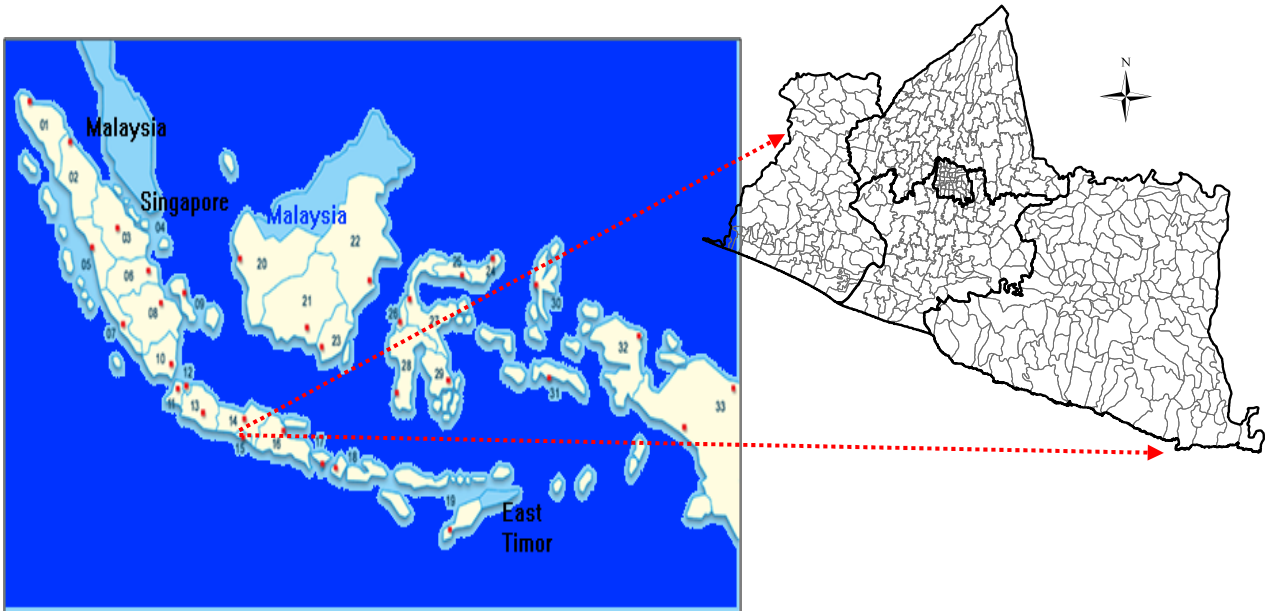
Numerous studies have been done with the aim of reducing variations in public services (William, Dennis et al. 1977; White 1979; Futoshi, Shyamal et al. 2007). However, there is the need to study variations with regards to the socioeconomic position of the villages and the spatial extent to which the variations persist. The study seeks to determine whether there is an association between the socioeconomic position of villages and provision of public services. For the purposes of this study, public services refer to education and health care. Education and health care services are important services and constitute significant portions of government expenditure. Identifying variations will help curb or minimize the influence of the more powerful and better off areas from having more services to the detriment of poor areas. In line with the study, appropriate indicators and the use of GIS and statistical software tools will be applied to mitigate the current situation.

This study uses aggregate village level indicators to measure spatial variations in the provision of health care and education in Yogyakarta. This is also supported by village level determination of socioeconomic position and its interrelation with health care and education provision.

1.5. Study area

This research is based in Yogyakarta in Indonesia, one of the world's most populous developing countries. Yogyakarta has a surface area of 318,580 ha (3,185.80 km^2), four regencies and a city, and four hundred and thirty-eight (438) villages. About a sixth of the estimated population of over 3,300,000 falls below the national poverty line (BPS 2008). The selection of the study area is in line with what the UNDP calls discriminatory distribution of public services which is common in developing countries. Deductions made from SEAR - WHO (2008) indicate the apparently inequitable distribution of public services in Indonesia. The report further shows that the country is improving in terms of public services. The socioeconomic position of the people has likewise improved. In terms of health care, with the introduction of *health centers* (HC) and *HC reforms* such as *Family Friendly Health centers* (FFHC), the health care sector has achieved some improvements. In terms of education, the compulsory elementary education has increased enrolment. In spite of the improvements, major challenges face the provision of public services. There are still some villages without the most basic form of health care. Some children have to walk over long distances to go to school.

The study looks into the provision of health care and education spatially to show the inequities that prevail and to point out policies for ameliorating this phenomenon.



Map 1-1 Location of study area – D I Yogyakarta
Source: (Indonesia-tourism 2009; PUSTRAL - UGM undated)

1.6. Research objectives

The main objective is to identify an approach to measure if the socioeconomic position of an area has an association with the provision of public services.
The sub-objectives encompass the following:

- To assess variations in the provision of public health care and education services.
- To assess the socioeconomic position of the villages.
- To examine the relationship between the provision of public services and the socioeconomic position of areas.

1.7. Research questions

To assess variations in the provision of public health care and education services.

- What is meant by variations in the provision of services?
- Which measures are typically used to quantify such variations?
- To what extent do the measures apply to developing countries?
- How can variations be measured in this context?
- To what extent does variations manifest spatially?

To assess the socioeconomic position of the villages

- What is meant by socioeconomic position?
- Which variables are typically used to quantify socioeconomic position?
- How can socioeconomic position be measured?
- To what extent do areas of similar socioeconomic position cluster?

To examine the relationship between the provision of public services and the socioeconomic position of areas

- Does a relationship exist between areas of low socioeconomic position and the provision of public services?
- Are areas of higher socioeconomic positions better served?
- How has the relationship been over time?

- Which other factors are associated with the provision of public services?

1.8. Hypothesis

Power is utilised when one is able to persuade another into submitting to his desires without the former's stance being affected (Tawney 1939). In his criticism of the British socialist system, Tawney (1939) disapproved of power centralisation and overconcentration of power. He sought for a system that promoted equity. He was of the opinion that people who exercise power or powerful groups or communities are able to lord their power over others inferior or less powerful to them. Walster and Walster (1975) in stating their stance on equity with regards to America, add that the more powerful are successful in capturing the lion's share of community goods and this assertion is also documented by many authors (Komorita and Chertkoff 1973; Michener and Cohen 1973). They defined powerful groups as mainly those who have the means to create more investment i.e. people of higher socioeconomic positions. As a way to undertake this study, it is asserted that areas of higher socioeconomic positions tend to have more public services as against areas of relatively low socioeconomic position. The study therefore seeks to examine this assertion in Yogyakarta.

1.9. General approach

The level of analysis is done at the village level (Map 1.1). Data is mostly secondary data. In order to get a sample as representative as possible, the entire province is used as study area.

The methodology follows the order of the research objectives. It starts with a review of literatures relating to the topic which are also used to select study indicators. This is followed by data analyses. For the data analyses, variations in the provision of health care and education are assessed first of all. This is done with indicators which are able to show the areas of good provision and those of worst provision.

Next to be assessed is the determination of the socioeconomic position of the various villages. Various socioeconomic indicators are combined and ranked in order to determine the areas of higher socioeconomic positions to the very least in terms of socioeconomic position.

The final part of the analyses is the comparison of the two earlier analyses for the purposes of identifying if socioeconomic position influences the provision of health care and education. Selected sections of the analyses would be compared over time to make the interpretation or comparison more concrete. This approach also encompasses the verification of findings against the health care and educational statuses of the villages.

The methodology involves the use of software packages such as SPSS/excel and GIS/GeoDa analyses to generate expected outcomes. The figure below attempts to summarise the overall design.

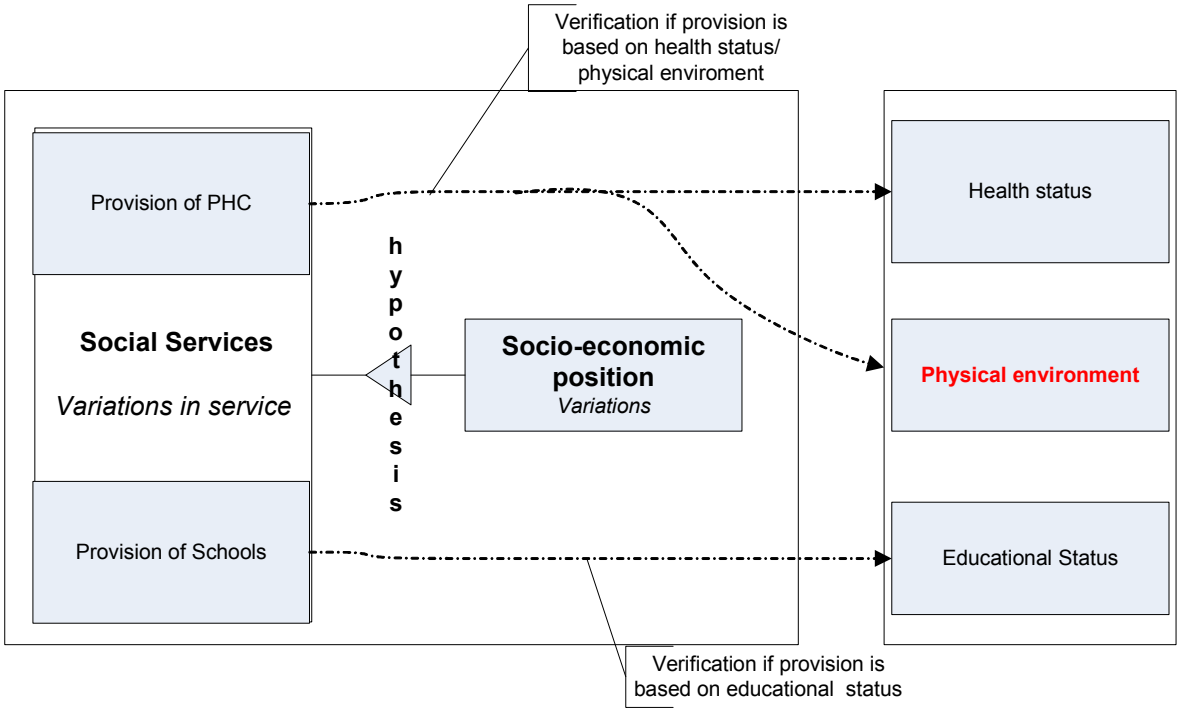


Figure 1-1 General methodology

1.10. Conceptual framework

As the world moves towards globalisation and liberalisation, more people have moved into cities causing population explosion (Turkstra and Raithelhuber 2004). Governments in their bid to be popular among people are striving to provide key services such as health care and education to meet this upsurge in population. However, health care and education are concentrated in areas with less need for them (Benson 2001).

Governments have sought to provide health care and education to all persons irrespective of socioeconomic position. People of higher socioeconomic positions however have more power and are able to command more resources than those on the lower side (Harvey 1973; Walster and Walster 1975).

Various authors have defined provision of services as encompassing elements of the nature of the distribution (Wyszewianski and Donabedian 1981; Ellencweig and Grafstein 1989). According to Werna (1995) as stated in Werna (1997), provision of services "*is defined as the act of ensuring that a given good or service is available and involves decisions regarding quantities and qualities, arrangements for production, financing, regulating and enabling producers*." Werna (1997) identifies imbalances in the provision of public services in Kenya; highlighting on health care imbalances in the poorer areas.

Provision of health care and education is done in the light of achieving equity such that benefits are evenly spread among various socioeconomic groupings. Amer (2007) identifies the need for the distribution of services to be within acceptable distances and travel time. This notion is covered by other authors who expand the concept to encompass quality and quantity as well (Ellencweig and Grafstein 1989; Werna 1997).

Marsh and Schilling (1994) admit that choosing the most appropriate scale of analysis for health care services is not an easy one. They however, proposed that a more appropriate scale will be dependent on the political situation and the characteristics of the population. This notion forms the background of the scale of analysis for this study which is the village level. This is the smallest administrative level in Indonesia and with the decentralisation policy of the country; the villages wield a high degree of autonomy. Very few studies have made use of this scale of analysis (Futoshi, Shyamal et al. 2007). In addition, Steiniger and Weibel (2009) elaborate on the importance of the spatial component of variation studies.

The conceptual framework of the study aims to bring together the missing part of the spatial scale of analysis as well as the influence of areas of high socioeconomic position in the provision of health care and education.

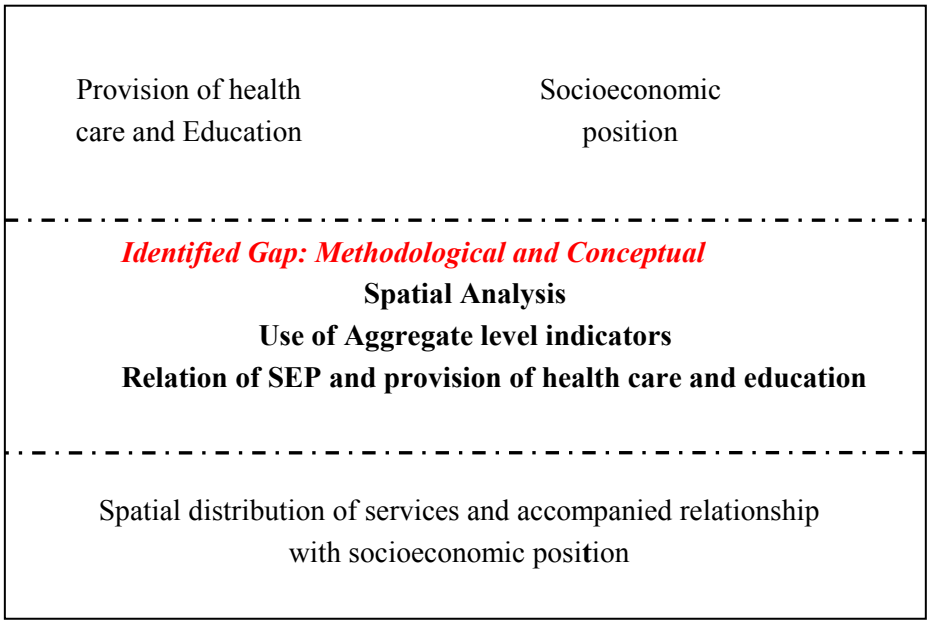


Figure 1-2 Conceptual framework

1.11. Limitations of the research

o Data for the study area are from secondary sources. One major source is the census collected by Badan Pusat Statistik (BPS), the government statistical bureau. These data from the BPS surveys have been collated and coded on various indicators of health care, education, tourism, transportation, etc. The analysis is therefore true to the extent of precision of the collation and coding of the secondary data. However, since the data from this source forms the bases for most government studies, policies and plans, it is deemed to be appropriate and reliable.

o Data from the survey are aggregated to the level of the village which allows for homogeneity or clusters only at the village level. This makes it impossible to identify the extent of heterogeneity pertaining to a village. However, with the decentralisation policy of the Indonesian government, data at the village level enables the municipalities to know which villages need more priority and how much budget to allocate per village. This reason makes this aggregation convenient.

1.12. Thesis outline

Chapter 1: Introduction
The background, research problem and objectives of the study have been introduced in this chapter. A summary of the approach and the justification of the study have also been stated in this section. A general impression of the rest of the study has been stated as well.

Chapter 2: Power, public services provision, socioeconomic position and appraisal methods
This chapter examines literature on the main concepts of power, SEP and public services provision. It highlights on the appraisal methods, areas of application and mode of selecting indicators. Based on literatures, a methodology is selected for analyses of the study area.

Chapter 3: Data characteristics and study area
Details of the dataset and study area are stated in this chapter. The sources, quality and limitations with respect to the available datasets are described. The case study is re-introduced into detail and in the context of the research.

Chapter 4: Assessing provision of health care and education
Exploration of education and health care indicators is done in this chapter. The exploration shows variations across villages and municipalities. Locations of villages with similar levels of health care and education provision are further investigated.

Chapter 5: Assessing socioeconomic position
This chapter follows a similar format as the previous chapter except that it elaborates on socioeconomic position and how it is measured. It also assesses the extent to which villages of different SEPs concentrate in rural and urban areas and across municipalities.

Chapter 6: Relating provision of health care and education to socioeconomic position
This is the peak of the research. The hypothesis is either proven or otherwise. The chapter compares results from the two preceding chapters to assess the hypothesis. It compares some aspects of the provision of health care and education over time among the various socioeconomic groupings. It further examines whether the provision of public services is influenced by health and education statuses.

Chapter 7: Conclusions and Recommendation
Findings of the study are summarised and recommendations for policy and future research directions are set.

2. Power, socioeconomic position, public services provision and appraisal methods

2.1. Introduction

This chapter highlights on what has been written in literature concerning the topic under discussion. It elaborates on how other authors have explained the concept of power and positioned citizens based on socioeconomic indicators. It further elucidates variations in the provision of public service (centering on health care and education) in relation to socioeconomic positions. Indicators often used by other studies are listed and based on that a selection is made for this study. The chapter is then concluded.

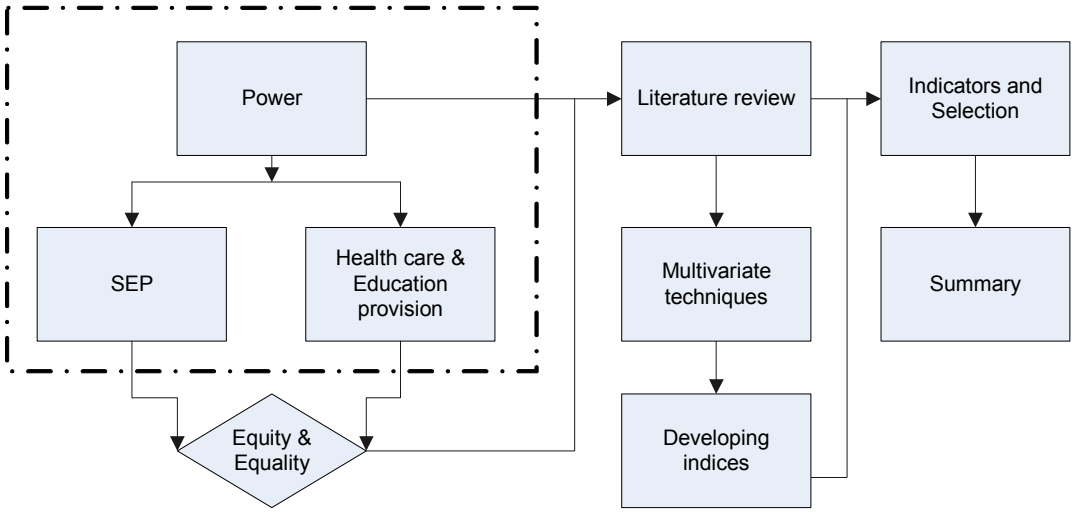


Figure 2-1 Summary of chapter 2

2.2. Power and class

Power is evident when one is able to influence others to follow a particular line; according to his desires (Tawney 1939; Walster and Walster 1975). This sort of power is pertinent among classes in various societies though some societies were hitherto without classes. Until the eighties, New Zealand has often been referred to as classless due to the small wealth range, high levels of class mobility and high standard of working class (Hazledine 1998). This situation was destroyed by the economic reforms of the then labour government and led to an increase in the number of the poor. The wealth gap was widened and hierarchical classes became apparent and so did power. Hierarchies exist in every society and are the ultimate determinant of power.

In a given political situation, power is exercised by people mostly at the expense of others (Rozeff 2006). Power is therefore seen as an influencing factor in a political economy. Rozeff (2006) stipulates that power is exercised by those who have an advantage over others. He elucidates power and wealth as gains and the central theme of politics. Power is seen as a limitless trait that people seek

and never cease seeking. Michener and Cohen (1973) as well as Komorita and Chertkoff (1973) earlier documented that powerful people can bargain successfully for a larger share of public goods.

Wealth is a function of class and a basic requirement of power (Harvey 1973; Liberatos, Link et al. 1988). Wealthy people are put in a class of their own and have accompanied power embodied in that class. They may be put in such a class by a governmental body as it is done in the UK (UK - ONS 2001). In the words of Kipnis (1972) as stated in Walster and Walster (1975), men become powerful so as to monopolise goods to enrich themselves. This assertion emphasises that wealth generates power and power generates more wealth or higher positions through successful bargaining and command over the distribution of services. The bargaining power of the rich is influential (Harvey 1973; Liberatos, Link et al. 1988; Berkman and MacIntyre 1997). This is described by Harvey (1973) as resulting from the well organised structure that rich groups possess. Such groups are smaller and are able to organise themselves and command more services without considering the effect on third parties or the wider, poor groups.

Various authors have identified categories of people according to their socioeconomic position and the power they wield (Smith 2008). This has formed the basis for further studies on whether the powerful in society are able to command certain services.

Walster and Walster (1975) infer that most of the documented evidences do not provide direct evidence in support of the contention that power enables people to capture a greater portion of public goods. They however affirm that existing evidence is substantial for such deductions.

2.3. Socioeconomic position (SEP)

Robert (1999) defines the broad circumstances by which an individual can be hierarchically stratified as socioeconomic position. Relating this to the community context, a community can be classified into various positions depending on certain circumstances. These circumstances encompass social and economic indicators such as community economic status including income level, income inequality and poverty level. Material standards such as percentage of households with access to a vehicle and average home value are also considered. Unemployment and percentage of workers in a given occupational class are core indicators of occupational status. Educational status is also salient. The community is defined to encompass an area consisting of subgroups or households such as a village, ward, etc. These characteristics are also useful for studies into inequalities in population groups (Robert 1999).

In a study conducted in California by Yost, Perkins et al. (2001), socioeconomic variables were used to define various socioeconomic groups and the occurrence of breast cancer within the groups. The study asserted that inequalities were high among minority groupings mostly of the low income groups. The study further emphasised the usefulness of using aggregate level indicators. Aggregate level indicators summarise the characteristics of people belonging to a village or other similar unit as one. The use of aggregate level indicators forms the basis of this study to determine the socioeconomic position of villages. This emphasis is also stated elsewhere (Dayal, Power et al. 1982; Liu, Deapen et al. 1988).

The concept of SEP is often used in epidemiological studies (the study of factors affecting the health care and illness of populations) with indicators which are mostly correlated. It is also referred to as

socioeconomic status (SES) in many studies (Dayal, Power et al. 1982; Kaplan, Haan et al. 1989; Adler, Boyce et al. 1994; Yost, Perkins et al. 2001; Shavers 2007). Other studies have referred to SEP as social class (Liberatos, Link et al. 1988; Berkman and MacIntyre 1997; Gidlow, Johnston et al. 2006).

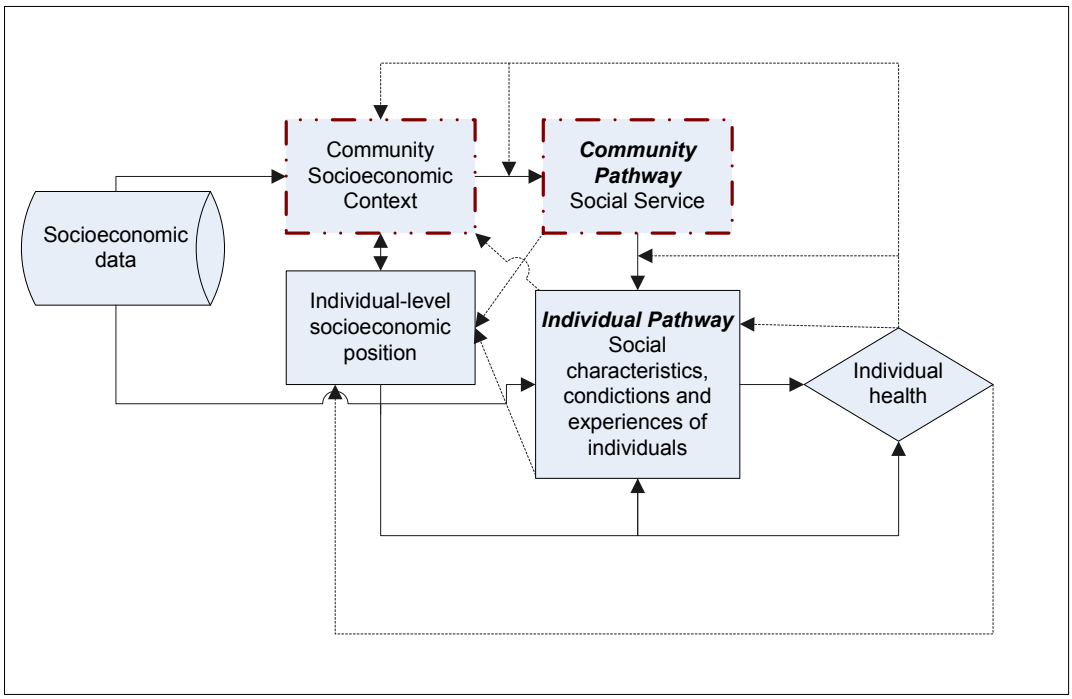


Figure 2-2 Community socioeconomic context and services provision
Source: (Robert 1999)

Studies on socioeconomic groupings have focused on relating indicators to the health care status of the population; others have considered indicators relating to individuals and households. From the figure above (figure 2-2), the author establishes the cause and effect relationship between the bigger community context and the individual or household level context. Socioeconomic data is used in the community context to determine positions to make inferences in the individual context. It is also used to study the behaviour or characteristics of any individual within the community. A link is also made to the impact of community level service on individual health care and vice versa (Gotway and Young 2002). The author in this research supports the use of aggregate level indicators and the extent to which deductions can be made on individuals or households' characteristics. The study attempts to establish the relative positions of the communities (in this case; villages) within the province so as to determine level of services available to the various socioeconomic positions. Determining the level of services would be based on variations in the nature of the provision of services among the various villages. This is useful for determining the relationship between the distribution of services and the socioeconomic position of the people. The use of deprivation indicators has been seen as a means to determine the socioeconomic positions of areas and such indicators are used in this study (Vyas and Kumaranayake 2006).

2.3.1. Socioeconomic position perspectives (past and present dimensions)

Classical writers such as Marx and Engels documented several theories on hierarchies or positions that existed in various societies (Marx 1850). Starting with the bourgeoisie which is a class that owned the means of production (raw materials, infrastructure, technology, etc); Marx asserts that they

wielded power due to their wealth, employment and education. The word *bourgeoisie* is borrowed from the french word 'Burgeis' which means 'an inhabitant of a town' (Encyclopedia of Public Health 2002). It was hitherto used for a class of citizens who were wealthy. It is now used in various contemporary circles to connote rich or influential lifestyles.

The other group identified by Marx is the proletariat which is used to characterise the lower social class. A proletarian meant a member of that class. The origin of proletariat is from the latin 'proletarius'; a citizen of the lowest class. This group survived by selling their labour. By these categories, power is eminent according to a group's position.

Since then, many countries have formulated their own classification of positions of their citizens. In China, four main classes are identified by Li (2005). These included the peasant class, working class, capitalist class, class of cadre and the quasi-cadre.

Since classes persist in various ways, the study initially attempts to categorise villages so as to determine their positions in relation to one another for further analyis. This will be done with reference to related literatures.

2.3.2. Socioeconomic position and inter-related concepts

Socioeconomic position is sometimes interchanged or confused with other related concepts. This session seeks to clarify the concept from related concepts.

a. Poverty

Poverty is defined as the lack of command over basic consumption needs (Ravallion and Bidani 1994). According to the Combat Poverty Agency (2002) as stated in Saunders, Naidoo et al. (2007), "*people are defined as living in poverty if their incomes are so inadequate as to preclude them from having an acceptable standard of living*." Defining what constitutes an acceptable standard of living is not easy. India places its acceptable standard of living on the expenditures for a minimum food basket with caloric norms of 2400 and 2100 for rural and urban respectively (Baud, Sridharan et al. 2008). In Indonesia, an acceptable standard of living is the estimated expenditure level at which a typical resident reaches the pre-determined mean food energy requirement of 2100 calories per person per day (Ravallion and Bidani 1994). Elsewhere such as Australia, people's incomes (adjusted to allow for family needs) are compared with a predetermined poverty line. This is for the purposes of identifying the poor and poverty trends (Saunders, Naidoo et al. 2007).

When people are unable to have what constitutes an acceptable standard of living, society sees them as worse off but SEP helps to know the extent to which some groups are worse off than others and vice versa.

b. Deprivation

One of the currently most researched areas is that of deprivation. As a concept, deprivation is deduced by Baud, Sridharan et al. (2008) as *"linked to ways in which households live and work, the access they do or do not have to collective state-provided resources and the extent to which poor households can make their needs heard politically or can organise collectively to build up assets*." One can deduce from this definition that deprivation connotes lack of some element(s). It can further be broken down into further constituents such as economic, financial, social, physical, etc.

Deprivation is similar to social exclusion but deal more with specific issues such as inadequate provision of services, lack of education, lack of income, shelter, etc. These specifics can be compounded into a multiple deprivation structure. It can be used to assess poverty and socioeconomic position as in the case of Scotland where several deprivation forms are combined into a composite index such as the Index of Multiple Deprivation (IMD) (Social Disadvantage Research Centre 2003) and in the New Zealand Deprivation Index (NZDep) (Salmond and Crampton 2002).

Deprivation is not SEP but is seen as a means for deriving the SEP of areas (Vyas and Kumaranayake 2006).

c. Social exclusion

Social exclusion as a concept gained more grounds in the 1970's and is explained mainly in the contexts of economic, political and social indicators (Bessis 1995). It occurs when people are denied equal access to rights and resources (de Haan 2004). People can be economically excluded when they are unemployed and do not have a regular source of income. Politically, when one is unable to take part in decisions affecting him, he is socially excluded. Again, one can experience the social form of social exclusion if he remains unrecognised or not respected.

According to Vranken (2000) as stated in Martinez - Martin (2005) social exclusion is further exacerbated in *"situations and processes such as polarisation, discrimination, poverty and inaccessibility"*. An individual or group may be socially excluded if they find themselves in polarised circumstances. When these elements occur in isolation or compounds, social exclusion is evident.

This concept is similar to socioeconomic position because they overlap in terms of the use of social and economic indicators however, socioeconomic position categorises people or groups distinctly.

2.4. Provision of public services; health care and education

Public services are defined in various ways in cross national and within national studies. In the USA, the term is substituted for social services and the definition encompasses, six main systems such as health care, education, income transfer, personal social services, housing and employment (Seley 1981). Other systems such as water supply, public transportation, etc are gradually being incorporated into this definition. Outside the USA, the term public service, government services and human welfare are some common terminologies for social service (Savas 1978; Werna 1997).

William, Dennis et al. (1977) draw attention to four types of public services; routine, developmental, protective and social-minimum services. Routine Services on the one hand are regularly used services which may not be available to everyone due to the payment of charges and is therefore not a pure public good. Though the service is a public one, it mostly ends up being provided privately. It is so called due to the frequently direct or indirect use of this service by everyone, irrespective of age, status, etc. Typical examples include water supply, sewage collection and disposal, and transportation (roads, bridges, mass transits), etc. For distributional purposes, everyone is considered equal and deserving of an adequate amount of this service. This is to say that when new areas spring up, such services need to be provided there and old ones replaced or rehabilitated with time. The rate of using this service remains the prerogative of a person.

The main purpose of developmental services is targeted at the physical, intellectual and psychological potential of individuals with education as the most important of these services. Such services promote development even though they play different social functions. Since these services are geared towards individual advancement, they may vary where old people are concentrated as against younger ones. Other developmental services include parks, recreation and libraries. These services are distributed on the basis that everyone within a jurisdiction is equal and should be treated equally in terms of facilities. Some of these services may also fall under social minimum services.

Protective services on the other hand, are for maintaining public order, security and protection for property and humans. Services here include Law enforcement agencies such as the police and the judiciary or courts; fire service, flood control. These services have specific and distinct functions. The police and fire services prevent crime and fire outbreaks respectively whereas the courts provide remedy or restitution for people whose rights are infringed upon. These services are mostly provided on the basis of equal treatment of equals (also horizontal equity) by administrators. A typical example is that in order to achieve equality in response time, patrols need to be distributed on the basis of service calls instead of the population. Fire services may likewise be distributed on the basis of fire losses instead of population.

The final type of service is that of social minimum service. These refer to those services which are mostly discussed as performing redistributive function of the economy. Services here include public assistance, hospitals, public and mental health care, food stamps, day care, manpower training, public housing, etc. These services are governed by policies which restrict administrators especially in the area of standards. The main principle of this service is that there should be a minimum which should meet the needs of people. It may not necessarily be provided equally but those who are ineligible should have a minimum benefit. Equal treatment is therefore essential here.

Public services are the resultant effects of social, political and economic activities. Due to the nature of each service, special obstacles subsist on the basis of provision of each type demanding more care in analysis. For the purposes of this study, education and health care which fall under developmental and social minimum services are considered.

2.4.1. Inequities in the provision of public services in America

There has been a lot of studies on the provision of health care and education in the United States of America (Marsh and Schilling 1994). However, it was not until the celebrated case of Hawkins v. Town of Shaw that the concept of equal rights to public services became entrenched (Marsh and Schilling 1994). In that particular case, the town of Mississippi provided a range of public services out of general tax revenue irrespective of property ownership. Evidence gathered by the court of competent jurisdiction showed that black residential areas were underserviced. The court found no reason for residents who were similarly taxed to have fewer paved streets, less sewage service, poorer street lighting, etc. It was held that the distribution of the services financed by the town's finance scheme was discriminatory. The distribution was also found to have contravened the Fourteenth Amendment of the constitution at that time.

Talen (2001) writes about the notion of equity and equality which forms the basis of the distribution of public schools and health care. She contends that various definitions are employed in the quest for

equitable distribution of these services. Studies (Talen 2001; Pearce, Witten et al. 2006) have used descriptive statistics such as the median, mean, variance in assessing the provision of schools and/or health care services. Others have used statistical analyses such as regression, correlation and Principal Component Analysis and yet still some studies also considered the use of spatial methods such as autocorrelation and others (Martinez - Martin 2005; Odoi, Wray et al. 2005).

2.5. Relating public services provision and socioeconomic position

Common approaches usually employed in studies on public services provision and SEP are elaborated upon further. They are equity and equality.

2.5.1. Relating public services provision and socioeconomic position (Equality context)

Equality as a concept used in analyzing the provision of health care and education is hardly achievable (Chitwood 1974; Smith 1994; Meade and Earickson 2000). Equality connotes the similarity of one thing to another in terms of quality and quantity. The achievement of the objective of equality is more than the absolute prohibition or elimination of discrimination. It encompasses a broader subject which requires constant and dynamic efforts to achieve results.

Equal treatment asserts the right to the same social conditions, salary, and work conditions for both women and men; privileged and less privileged. Equality avoids discrimination and any form of segregation. Equality and equity are seen as building blocks to assessing the spatial distribution and spatial pattern of public services like education and health care (Talen 2001).

2.5.2. Relating public services provision and socioeconomic position (Equity context)

The concept of equity has evolved over time to include a host of activities and concerns. Some writers admit the difficulty in defining and analysing equity (William, Dennis et al. 1977; Seley 1981; Marsh and Schilling 1994). Webster's define it as 'fairness', 'justice' and 'impartiality'. Marsh and Schilling (1994) define it with an illustration of a discrete entity placed in a spatially distributed population such that when the effects of that facility vary with the distance from it, differential effects within the population are experienced resulting in inequities. Equity involves going beyond economic and political barriers so as to give access to education and basic services such that people can enjoy these opportunities and benefit from them. It's a concept that promotes equality of opportunity and capacity development.

To make equity less complex and easily understood, Oppenheim (1968) as stated in Chitwood (1974) explains equity in the provision of public services in three main ways. They are equal services to all, proportional service to all and unequal services.

Equal services to all is a measuring concept that is hardly achievable (Chitwood 1974). Equality of services is ideal however it is not possible in the real world because of moderate scarcity, selfishness and actual inequality (Smith 1994). The author sees it as not necessarily right. This is difficult because of the greed of some particular persons or group. These groups may influence the administrative system making it difficult to achieve this outright. Many governments have however

blamed their inability to achieve equality on lack of finances. This measure is usually not used in assessing equity as the impure public goods make it an inadequate basis.

Proportional Equality refers to situations where services are distributed to reflect specific characteristics. This measure deals with unique cases such that the basis of assessment for each service varies with the peculiar characteristics of the case. This measure is realistic as it provides objective bases for the distribution of services among people. Perceived need is the key determinant of provision here and as it rises, more services are provided. This measure however has its own setbacks. It is difficult to determine the exact number of services that meets some specific needs. The same excuse of financial difficulties forces governments to shy away from this measure.

Unequal public services as a third approach in defining equity relates to delivering public services in amounts corresponding to relevant differences in some characteristic possessed by people. This is different from proportional equality as the total amount of services produced is not necessarily congruent to the amount or relevant differences in each recipient.

Similarly Talen (2001) asserts that equity can be defined as equality, need or compensatory equity, market considerations and demand-driven equity. These studies emphasise however that the distribution of health care and education is done so as to meet approximate minimum living standards. It involves recognition of diversity without discrimination. Equity also ensures that people get and benefit from what they deserve by law (Field 2000). The Commission on Social Determinants of Health Care (2008) recommends in its report the need for World Health Organisation (WHO) to urge governments towards a concerted effort at reducing inherent inequities due to power and wealth.

2.5.3. Constructing equitable indices of variation

This section elaborates on the various ways of looking into inequities using indicators, indices, etc. Indices are combined indicators that measure a particular condition. Carr-Hill & Chalmers-Dixon (2002) elaborate on three levels of an index; indicators, domains and finally the index itself. These are in order from the lowest level to the highest. Domains and indicators may be derived from literature or some norms. What to include or exclude in an index depends on the researcher and the purpose of the research.

Indices can also be ranked to show variations in terms of a condition or state per village. Various measures have been employed by researchers to measure variations. Measures of deprivation are important for measuring such variations and indicators employed may be economic, social, physical, natural, etc. Typical examples of variation indices are the Scottish index of multiple deprivations (SIMD), the England index of deprivation, the New Zealand index of multiple deprivations (NZDep) and the general index of multiple deprivations (IMD) employed in studies in India. The SIMD identifies concentrations of multiple deprivations in small areas called Lower Super Output Areas (LSOA) in Scotland. Based on the concentrations, areas are ranked to show their socioeconomic position relative to one another. This approach makes it possible for effective policies to be targeted at appropriate areas.

Three main categories of deprivation indices relate to public services especially health care and include (Field 2000):

- Service utilisation indices

- Mortality statistics indices
- Socioeconomic conditions or disadvantage indices

These involve either subjectivity, non-subjectivity or a combination of the two in the weighting approach.

a. Service utilization indices

Service utilisation indices measure the actual extent to which people make use of public services. The main assumption here is that the system is in equilibrium and that levels of usage directly reflect levels of need. Major criticisms are based on the fact that other factors such as accessibility affect utilisation rates. Due to this, such indices are often not likely to reflect levels of inequalities.

b. Mortality statistics indices

Mortality indices have gained popularity with some researchers but have their own shortcomings. Mortality represents the most extreme point of a spectrum of health care outcomes which is usually as a result of failure of the services to address underlying needs early enough or in the right way. Mortality cannot also be assumed as resulting directly from failure to notice needs or of the wide range of factors that determine need.

c. Socioeconomic conditions or disadvantage indices

Indices of this nature have a more indirect approach. They attempt to measure the factors influencing health care, education and the need for them. They are premised on the assumption that strong correlations exist between level of disadvantage and health care or educational status and mortality. Thus it incorporates aspects of the earlier two indices and are devoid of the shortcomings that persist in the above two categories of indices.

This study develops socioeconomic indices to measure the socioeconomic position of villages in the province of Yogyakarta by incorporating indicators based on selected literature. A similar approach would be employed to develop indices of health care provision.There is the need to understand how indicators are employed in the development of such indices.

2.5.4. Indicators as means of measuring public services provision and socioeconomic position

Indicators have been identified by various authors as very useful for studies involving socioeconomic divisions and the supply of health care and education. An indicator is defined by the chambers dictionary as "*...something that provides an indication, a pointer...any device for exhibiting conditions for the time being*". This definition is expanded by the OECD (1993: 5) as "*A parameter, or a value derived from parameters, which points to/provides information about the state of a phenomenon/area with a significance extending beyond that directly associated with a parameter value*". In relation to management, an indicator is defined as "*a piece of information which is part of a specific management process, and has been assigned a significance beyond its face value* (UNEP/RIVN 1994: 5) ". Health care indicators are seen as part of information systems that give added value to data for easy comprehension by policy makers (von Schirnding 2002).

An indicator for health care or education provision can be specific or composite (von Schirnding 2002). The latter implies that indicator variables may be condensed into a single measure called an index such as health care performance index. Likewise indicators are useful for determining positions of people within society (Galobardes and Morabia 2003; Pearce, Witten et al. 2006). Furthermore,

indicators can be concerned with processes (inputs), outcomes (performance) and outputs (von Schirnding 2002). Adriaanse (1997) and Martinez-Martin (2005) elaborate on indicators being descriptive, normative and performance. Inputs are defined as contributions to an exchange and outcomes as negative or positive receipts of a relationship (Walster and Walster 1975). Descriptive indicators reveal a particular state or process and are useful for targeting and identifying need areas. Normative or target indicators help to evaluate and compare results of an indicator with a norm and are useful for policies directed at priority areas. Performance or outcome indicators highlight achievements by measuring whether the policy goals have been achieved and peoples' satisfaction as well. In order for clarity between output and outcome indicators, the New Economics Foundation as stated in Martinez-Martin has this table to show it:

Table 2-1 Measuring outcomes and others

	Inputs	Outputs	Outcomes
Definition	Resources (money, time)used for achieving particular aims	Project activities (deliverables) carried out in order to achieve aims (eg. a community garden)	The effect or impact of the project activities.
Measuring	How much resource has been spent on activities aimed at achieving this goal?	What activities have been carried out in order to achieve the aims? How have they been carried out - good/bad practice?	What has been the impact of the project activities? How far have aims been achieved?
Features	Easy to measure, can be measured early in project life. Less meaningful in terms of project aims.	Easy to measure later, or at the end of a project. Fairly meaningful regarding project aims.	Most directly related to project aims. Impacts on people take time. Lots of them tend to happen after the lifetime of a project. The impact of a local project can be influenced by external factors.

Source: New Economics Foundation (2000) as stated in Martinez-Martin (2005).

Other classifications exist on health care, education and socioeconomic indicators and are summarized based on UNEP/RIVN (1994) and UNDP (2000):

- Process indicators identify and reveal drivers of change. They are explanatory in nature and help to know how mechanisms of change are inter-related.
- Impact indicators establish how socioeconomic change is impacting on society and form the basis of goals and targets. Results of indicators are debatable if underlying causal linkages of socioeconomic change and assumed impact is faulty.
- Key indicators are appropriate where factor analysis shows high correlation with a group of indicators or an indicator is able to represent the actual situation across a range of indicators.
- Lead indicators provide early warning in a system.
- Lag indicators impact upon a whole group of indicators passively but are able to singly capture responses to change. A typical example is that of employment.
- Critical variables represent points of connectivity of a system. It is assumed that if a critical variable changes then other variables also change.
- Base indicators are the core of other indicators and impact strongly on other indicators. They play political and symbolical roles.

Depending on a particular study, relevant national or local level health care, education or socioeconomic indicators are employed though clear boundaries are nonexistent. For health care, indicators are mostly dependent among others on the degree of decentralisation, data availability and quality (OECD 1993; Kunst 2008).

Using indicators of health care and education provision as well as socioeconomic position is helpful in spite of the following shortcomings identified by PREST/CRIC (2006) and UNEP/RIVN (1994):

- Indicators never completely capture the richness and complexity of a system. They may not represent the detailed picture of reality. This however calls for caution in making deductions from results and the context of usage must also be clear.
- Indicators are operationalised with the use of numbers and numerical techniques. Efficient use of indicators requires an extensive knowledge on elementary statistics and ability to handle numbers.
- Indicators are fault-finding. Most studies have used indicators to only determine priority areas or faulty areas. This is because indicators are designed as high level summary of a system and help to identify and prioritise issues that are worth investigating. However, they are able to show if a system is also performing well.

The authors caution on the need to adopt right indicators at the right time in the right context as well as the appropriate transformations and weighting mechanisms for ranking purposes.

a. Z-Score transformation of indicators

In the development of indices, indicators in different dimensions cannot be combined outright. Also, indicators with bigger numbers or wider range may influence the overall impact of the index. To this, indicators need to be standardised so that their distributions are similar.

The z-score is also called a standard score and is represented as follows (Field 2000; Social Disadvantage Research Centre 2003):

$$z = \frac{x - \mu}{\sigma},$$

where:

x is a raw score to be standardized;
μ is the mean of the population;
σ is the standard deviation of the population.

For the purpose of this study, z-scores are used to standardise indicators for comparison over time and for comparison of indices.

b. Criteria for selecting study indicators

From the discussions preceding this section, there is no hard and fast rule as to which indicators to use for what purpose. There is no internationally accepted standard. This study therefore selects indicators based on literature taking into consideration the following:

- The study area context
- The degree to which data is available

- The geographical scale of work

The following literatures are considered as a means to selecting the final indicators for the study. The literature is selected based on some criteria;

- That the literature is by a recognised body such as World Health Organisation, OECD, etc.
- That the literature represents the contexts of at least a developed and/or developing countries
- That the focus of the literature is related to the concept under this study.

c. Selection of study indicators

The section is divided into three parts. The first part deals with indicators related to SEP. Indicators related to the provision of health and education is elaborated upon below.

The table below summarises indicators for assessing socioeconomic position. It highlights indicators mostly used by other countries to study socioeconomic conditions or patterns of areas. The study considers SEP indicators upon comparison across literatures and countries.

	Developed Countries											Developing	other
Socioeconomic Indicators	Witoelar, Sikoki et al.(2009)	Lahelma, Martikainen et al. (2004)	Marks (1999)	Kirby and Kaneda (2005)	Kirby and Kaneda (2006)	Robert (1999)	Norman (2009)	Gidlow, Johnston et al. (2006)	Kaplan , Haan et al. (1989)	Galobardes and Morabia (2003)	Odoi , Wray et al. (2005)	Futoshi, Shyamal et al. (2007)	WHO (1996)
Income (poverty line)	●	●		●	●	●		●	●	●	●	●	●
Educational status (lit/illiteracy)	●	●	●	●	●	●		●	●	●	●		●
Occupational status (employed/ Unemployed)	●	●	●	●	●	●	●	●	●	●	●		●
Asset base /wealth index	●		●	●	●	●	●	●					
Area of residence								●		●	●		
Dwelling value/nature					●						●		●
Overcrowding							●						
Total population (rural/urban)		●	●										
Age groups		●								●	●		●
Fertility rate													
Electricity consumption													
Marital status		●								●	●		
Gender (women/children)		●											
State/ private pensions and welfare									●	●			
School dropouts											●		●
Migrants population	●										●		
Non-official language speakers											●		
Living space per inhabitant													●
Homelessness (count)													●
Work absenteeism rate													●
One person households													●
Single-parent families													●
Government support													●
Crime rate													●

Table 2-2 Literature summary of socioeconomic indicators

From the review of literature on socioeconomic indicators, certain variables are dominant. In determining the SEP for an area, income, educational status, asset base, area of residence, nature of residence, welfare, marital status and educational level are the most dominant.

In the light of the above (literature, scale & data availability), the following are considered:

1. Percentage of houses that are temporary
2. Percentage of households living in slums
3. Percentage of households that are poor
4. Percentage of households that received poor letters
5. Percentage of buildings that are not luxurious
6. Percentage of households without 4 wheel drives
7. Percentage of households without 2_3wheel drives
8. Percentage of households without satellite dish
9. Percentage of households without phones
10. Percentage of households without radio communication
11. Percentage of households without phones
12. Percentage of households without health care insurance
13. Percentage of people who do not use family planning
14. Percentage of households whose children have not studied in the university

Due to the nature of this study, other factors such as the physical condition of the villages, health care and educational statuses are used for further understanding and validation of the results of the relationship analysis. In view of this, such factors especially health care and educational statuses which are usually considered by most authors as socioeconomic indicators are excluded in the assessment of socioeconomic position. This is to remove bias and redundancy in analysing if other factors affect the provision of services. The indicators for education and health care are illustrated below.

Table 2-3 Literature summary of provision of education indicators

Education	Talen (2001)	Gulosino & Crocker (2007)	Sudhir and Yassir (1995)	Futoshi, Shyamal et al. (2007)
Number of teachers				●
Number of educational facilities	●	●		●
Ease of access		●	●	
Need			●	
Distance	●	●	●	●

Table 2-3 lists indicators of educational service provision from selected publications. From the table, dominant indicators used in the analysis of educational provision include: distance, facility count and ease of access. In this study, the main educational level considered is that of primary.

The components of health care provision are shown below.

Table 2-4 Literature summary of provision of health care indicators

Health care	Kepoglu (2005)	Kirby and Kaneda (2005)	Kirby and Kaneda (2006)	Sudhir and Yassir (1995)	Futoshi, Shyamal et al. (2007)	Werna (1997)	WHO (1996)
Bed Capacity	●	●	●			●	●
Number of health care personnel	●	●	●		●	●	●
Number of health care facilities	●	●	●		●	●	
Treatment statistics	●			●			●
Governmental annual expenditure	●						
Distance				●	●		●
Health care insurance coverage							●
Need				●			
Ease of access				●			
Existence of self-help organisations							●

Table 2-4 lists indicators of health care provision from selected publications. From these publications, a number of indicator variables are common. Bed capacity, health care personnel and facilities count, treatment statistics and distance are dominating the list. In consideration of how these publications have employed the indicators, the study develops indices based on population per facility and distance. Facilities provided at the village level are considered such as health centers, maternity clinics and medicine posts.

d. Weighting Indicators

For an index, weightings are necessary and also for indicators. Subjectivity or otherwise comes in when a particular weighting approach is used. Weightings are applied based on five main approaches (Social Disadvantage Research Centre 2003).

The first approach is based on literature. This can be done by considering evidences available in researches where similar theories and methods are employed.

Again based on empirical evidence, weights may be derived from perceived experience and validated through multivariate analyses such as regression or Cronbach's Alpha). Principal Component Analysis (PCA) may also be useful for generating weights for indicators.

Further, weights may also be distributed equally or otherwise based on public expenditure or policy areas.

Fourthly, preferences or opinion of experts and decision makers may be considered and weights generated upon consensus.

The final approach is through arbitrary ways. Choosing weights without any reference to any of the above ways whether equal weights or not or even in the absence of empirical evidence are within this approach.

Knowledge of the indicators and weightings to be used in the study is not enough. There is the need to identify an effective and equitable approach that can be used to construct the required indices and the next section deals with an exploration of techniques and the final selection of technique for this analysis.

2.5.5. Developing indices for socioeconomic position and health care provision assessment

In constructing socioeconomic conditions or level of health care provision indices, multivariate methods may be employed. Multivariate methods allow simultaneous study of several variables. It is useful for in-depth exploration into possible patterns that might exist in data, graphical representation of complex interrelationships and dimension reduction for further analysis.

Several techniques exist in handling multivariate data in developing-country surveys. The table below summarises those that may be used in the construction of an index. These are mostly termed exploratory techniques (Abeyasekera 2005).

Table 2-5 Some multivariate techniques and their purpose

Multivariate technique	Purpose of technique
1. Multivariate Analysis of variance (MANOVA)	Extending the univariate analysis of variance to the simultaneous study of several variates. The aim is to partition the total sum of squares and cross-products matrix among a set of variates according to the experimental design structure
2. Discriminant Analysis	Determining a function that enables two or more groups or individuals to be separated
3. Canonical Correlation Analysis (CANCOR)	Studying the relationship between two groups. It involves forming pairs of linear combinations of the variables in the multivariate set so that each pair in turn produces the highest correlation between individuals in the two groups
4. Multidimensional scaling (MDS)	Constructing a map showing a spatial relationship between a number of objects, starting from a table of distances between the objects
5. Descriptive Multivariate Methods	Data exploration; identifying patterns and relationships
6. Cluster Analysis	Identification of natural groupings among cases or variables
7. Factor Analysis	Modelling the correlation structure among variables in the multivariate response set by relating them to a set of common factors
8. Principal Component Analysis (PCA)	Dimension reduction by forming new variables (the principal components) as linear combinations of the new variables in the multivariate set

Source: (Abeyasekera 2005)

a. Multivariate analysis of variance

Multivariate analysis of variance is used to determine if a set of categorical predictor variables is able to explain the variability in a set of continuous response variables. Its main focus is to depict that an independent variable has an overall effect on a collection of continuous dependent variables.

b. Discriminant analysis

This type of analysis makes it possible to determine which variables discriminate between two or more naturally occurring groups. For instance a social researcher interested in finding which variables best predict whether an area is rich, partially rich or not at all may record a set of characteristics and may perform a discriminant function analysis to determine the best discrimination between the types. It is similar to ANOVA and is sometimes referred to as a one-way analysis of variance but the main concept is to determine whether groups differ with regard to the mean of a variable and then to use that variable to predict group membership.

c. Canonical correlation analysis (CANCOR)

It is adopted as a way of measuring the linear relationship between two multidimensional variables. It can also be useful for clustering data through the use of lemmata or lemmas (a subsidiary proposition that is assumed to be true in order to prove another proposition). It is the correlation between two canonical (latent) variables, one representing a set of independent variables and the other, a set of dependent variables. The correlation is optimised such that the linear correlation between the two latent variables is maximised. It is based on a many-to-many relationship as there may be more than one such linear correlation relating the two sets of variables. It is therefore to explain the relation of the two sets of variables not to model individual variables.

d. Multidimensional scaling (MDS)

A multidimensional scaling technique comprises various techniques often used in information visualisation for exploring similarities or dissimilarities in data. It is sometimes used as an alternative to factor analysis. It is useful for detecting meaningful underlying dimensions that allow the researcher explain observed similarities or dissimilarities. It actually moves objects in space defined by the requested number of dimensions and checks how well the distances between objects can be reproduced by the new configuration.

e. Descriptive multivariate analysis

Descriptive multivariate analysis refers to a set of statistical methods for exploratory analysis of large datasets and categorical data. This approach uses graphical aspects of multidimensional scaling techniques.

f. Cluster analyses

Cluster analyses encompass a number of different algorithms and methods for grouping objects of similar nature into groups. Commonly used synonyms are segmentation, partitioning and unsupervised classification. It divides data into meaningful and/or useful clusters. Its usage cuts across various disciplines; psychology, biology, social sciences, statistics and the like are few of such disciplines. It is flexible and appealing to use for groupings if caution is applied.

g. Factor analysis and principal component analysis (PCA)

Principal component analysis explains data as linear combinations of independent factors. PCA is useful for finding optimal ways of combining variables into a smaller number of subsets. Resulting

components are uncorrelated with each other and are weighted combinations of original values in order of decreasing variance. It is often used synonymously with factor analysis, though factor analysis is differentiated as an approach that seeks linear combinations of variables underlying fundamental quantities of which the observed variables are expressions. Factor analysis identifies structures underlying variables so as to estimate scores to measure latent factors themselves.

The two approaches are useful for analysing groups of correlated variables representing one or more areas of study such as socioeconomic status, health care, etc. They come in handy when the dimensionality and structural composition of data are unknown.

2.5.6. Limitations of multivariate techniques

The use of any particular technique depends to a large extent on the objectives of the researcher, data and analytical capacity, the concept adopted by the researcher, etc. Having identified above, the multivariate analysis available to the researcher, the strength and weaknesses are enumerated and considered in the light of the objectives of the researcher as well as the data available.

Table 2-6 Strengths and weaknesses of multivariate techniques

Technique	Strength	Weakness
Multivariate Analysis of variance (MANOVA)	Useful for finding effect of independent on dependent variables	May require rather large sample sizes Prefers that groups have similar number of cases in each group
Discriminant Analysis	DA is reasonably robust with respect to departure from the standard assumptions. Optimal yet simple, complete and accurate classification technique	The extent to which performances degrade when the class densities depart has no definite answer. As many covariance matrices have to be estimated as there are classes.
Canonical Correlation Analysis (CANCOR)	Useful for set classification (two sets of variables at a time)	Retains few variables Distortions may result from the use of less important gradient Instability of coefficients due to smaller sample-to-variable ratio.
Multidimensional scaling (MDS)	Useful in perceptual mapping	
Descriptive Multivariate Methods	Easy to use Basis for further analysis	May oversimplify analysis
Cluster Analysis	Ability to indicate group membership	Loner tests may be found in inappropriate but meaningful clusters. Algorithms still find structure even if no structure is present
Factor Analysis	Easy to use Useful for lots of survey questions Basis for further analysis	Variables have to be interval scaled
Principal Component Analysis (PCA)	Efficient computational mechanism Easy to comprehend and useful in studies from surveys. Simplify complex data	PCA involves only rotation and scaling Construction is abstract

Extracted from: (DeCoster and Claypool 2004; Abeyasekera 2005)

From the table, multivariate techniques have benefits and limitations. Some are seen to be difficult to interpret and are easily distorted (CANCOR), others are used for specific purposes (MDS, MANOVA). Then again, some are algorithmic-wise quite uncontrollable (Cluster analysis), others require large datasets/samples (DA) and finally some are easy to use and understand (Factor analysis, PCA). As explained earlier, factor analysis identifies structures underlying variables in order to measure latent factors but this is not the focus of this study though it does every other thing PCA does. The study makes use of PCA to develop indices due to its efficient computational mechanism, simplify data and easily comprehensible computations. SPSS is the main software tool used for the PCA analysis.
For visualisation and further analysis such as spatial clustering, ArcGIS and GeoDa software tools would be employed.

2.6. Summary of chapter

This chapter has examined literature on the concept of power, socioeconomic position and provision of health care and education. It has brought out the core determinant of power which is evidenced by socioeconomic position of the communities or villages. The chapter has looked into how socioeconomic positions and provision of health care and education are quantified and appraised based on selected literatures. Furthermore, the study has related the interplay of socioeconomic position and the provision of health care and education. Techniques used in combining these indicators are elaborated upon and a final technique is selected. The level of analysis is the village level and its significance is elaborated upon in the next chapter as well as the methodology for this study.

3. Data characteristics and study area

3.1. Introduction

This chapter deals with an in-depth overview of the dataset and study area. It first part highlights on the nature of datasets that are used, source and quality. The extent to which the data is limited is also stated. The other part gives details on the demographical and economical aspects of the study area. It further elucidates current policies on health care and education provisions as well as the distribution of these services.

3.2. Secondary data sources

This section describes dataset derived from public sources and are used in the analysis. They are also used to substantiate some findings.

- BPS Statistic year book

This is a book in which is contained selected data from various years. These include: consumption and expenditure, demography**,** education, employment, energy, terms of trade, health care, science & technology, housing, population, mining, transportation, etc.

- Standard guidelines of minimum service level

This is a guide adopted by the minister of settlement and area infrastructure to ensure quality in the provision of public services such as fire service, health care, police, parks, education, etc. It sets the minimum standards that must be met for a particular public service. These guidelines are based on surveys carried out across provinces in Indonesia and may be adjusted based on peculiarities.

- Atlas Agenda

This contains information on conditions pertaining to the province and is compiled by each provincial and municipal office. Time series information on the region as a whole is found there. That compiled by the municipalities is known as Triple A. All reports are based on multi-stakeholder involvement. Those under consideration for this study are:

- Special Province of Yogyakarta Report 2005
- Gunungkidul Municipality Report 2005
- Kulonprogo Municipality Report 2005
- Sleman Municipality report 2005
- City of Yogyakarta Report 2005
- Bantul Municipality Report 2005

3.2.1. Selection criteria for study area

The study area is the province of Yogyakarta. The level of analysis is the village level. In all, 438 villages are analysed. The entire province is chosen partly because there is the need for a representative population for the analysis and subsequent results. It is also because of the peculiarity of the area in the light of the following:

- The availability of data
- The need for a developing country context
- The quality of data

3.2.2. Questionnaire from BPS

The dataset is based on the BPS census 2000 and cover a wide range of topics ranging from village potentials; social themes such as religion, organisations, welfare; sports and recreation such as football; parks and reserves; health care facilities, personnel and status; educational facilities and status; public and private transportation; land sizes and related use; various forms of agriculture and equipment; economic sectors encompassing credit facilities and employment characteristics. BPS organises various censuses but the rest are either agriculture-based or economic based. That of 2000 cuts across all dimensions.

3.2.3. Pre-processing of data

The year 2000 BPS census dataset is large and raw. Large in the sense of over 300 disjointed attributes and about 70,000 records. It is raw in the sense that there is the need to recode for clearer understanding. A greater part of the dataset is tabular and disjointed with no unique id to connect one another. This requires a careful and time consuming process of identifying the right way to sort out all the data such that each village in the administrative base map would correspond to the tabular datasets.

The administrative base map has 438 villages falling within 77 districts. For each district, the village ID starts from one. This means the village IDs are unique only in the district within which it falls making it impossible for the village ID to be used as a unique ID field. In order to create a unique ID, careful sorting and pre-analysis is used to verify if a newly created ID field can join rightly with other datasets. Manually, a new ID field is created. The base map is projected onto the right coordinate system for further analysis. This map is from Center for Transportation and Logistics Studies in Gadjah Mada University (PUSTRAL UGM), a research center for transportation and regional development in Indonesia.

The tabular dataset contains data on various other provinces as well and require time and care in extracting data for the province of Yogyakarta. The extracted tables are re-coded for easier comprehension and a unique ID is also created for use in further analysis.

Table 3-1 Summary of dataset

Dataset	
Base map	Administrative boundaries, midpoints of villages
Geodatabase	Tabular data for analysis of health care and education as well as socioeconomic conditions of the various villages.
Jpegs (pictures)	Pictures showing general socioeconomic conditions and health care

3.2.4. Data quality

Dataset are obtained from Badan Pusat Statistik (Statistics Indonesia), governmental institution that undertakes the following based on law (Surbakti, Praptoprijoko et al. 2000; BPS 2008):

- To provide data to the government and the public. It undertakes comprehensive statistical activities, such as periodic information on structure and growth of economy, social change, and development. It has two main sources of deriving data/statistics. One source is its own researches and surveys. The other source may be from other government departments as secondary data.
- To develop statistical systems for government departments and other institutions by helping these departments to setup work program and periodic reporting scheme.
- To present health care and education related services, train people in statistics and to develop and promote standards for use in the implementation of statistical techniques and methods.

BPS undertakes various kinds of censuses on a regular basis. Every ten years (ending in a year with the number zero), BPS conducts population census which covers the entire Indonesia. In between censuses, agricultural census is conducted in years ending with three and economic census is conducted in the years ending with six. Other surveys are conducted by BPS as and when the situation calls for it including intercensal population surveys, labour force surveys, etc.

BPS surveys go through an extensive process beginning with a reconnaissance or test of the survey or questionnaires. This follows the actual conduct of interviews and subsequent compilation of the interviews. Data is scrutinised and crosschecked by the processing unit to reduce inconsistencies. This has been the trend over the years and has led to the creation of a formidable data warehouse.

3.2.5. Data analysis

The study identifies indicators that are relevant for measuring the level of services provided as well as the socioeconomic position of the villages in DI Yogyakarta. In assessing the level of health care and educational services, indicators are explored to identify patterns and trends. The indicators after showing traces of underlying relationships are analysed simultaneously into indices especially for health care provision. These indices are computed using weights generated from Principal Component Analysis (PCA). In order to identify the socioeconomic position of the villages, a similar process is followed and two indices are retained. With the use of geoDa (software from the GeoDa center for Geospatial Analysis and Computation), spatial autocorrelations are conducted to identify if hotspots of low service provision and SEP are clustered spatially.

The final part involves establishing a relationship between the level of services provided and the socioeconomic position of the villages. The table 3-2 summarises the approach and the proceeding chapters elaborate more on the analysis.

Table 3-2 Summary approach for relating service provision and SEP

	Indicator	**Index**
Indicator	A	B
Index	C	D

From table 3-2, with the use of statistical tools such as SPSS and excel, the relationship between the individual indicators of health care and education are related with those of socioeconomic position. This is followed by relating indicators and indices and finally indices of health care against socioeconomic position indices. This is necessary to assess the hypothesis.

3.2.6. Data limitation

This study relies heavily on secondary data for analysis requiring the need to apply caution in its usage. Some issues that must be noted as limiting the usage of the data and the study as a whole include the fact that the data is deficient in socioeconomic aspects such as occupation, income, etc which are very important factors. There is also no data on the location of the health care and educational facilities. The basis of the census may be such that the data collected may not necessarily be useful for valid conclusions on other concepts such as this study's concept. Babbie (2007) as stated in Darmawan (2008) identifies logical reasoning as key to making any such validations. Other studies use this dataset alongside other surveys to compliment the explanation of the analysis for their study (Surbakti, Praptoprijoko et al. 2000; Futoshi, Shyamal et al. 2007).

There is secondly, the issue of non-availability of data. Some data available on some governmental websites and even BPS are aggregated to the provincial level. This makes it difficult finding alternative information/data to complement dataset.

Again some data available at the village level are not comparable. This means the municipalities may have the data in different formats which make it impossible for effective comparison with other villages in other municipalities. This is also similar to other inconsistencies found by the author on other governmental websites. For instance, data from BPS on demographics tend to vary slightly from that on the website of the Indonesia embassy in Canada. These inconsistencies however bear more similarities than dissimilarities though they might influence the reliability and validity of the study to some extent.

3.3. Overview of Yogyakarta

The province of Yogyakarta is located in south-central Java and is the second smallest province (aside Jakarta). The province is one of the 33 provinces in Indonesia. It is bounded on the south by the Indian Ocean and surrounded by the province of Central Java. Its specific geographic location is 7° 47′ 0″ S and 110° 22′ 0″ E. It is said to be a special region as it still has its pre-colonial monarchy embedded in the administrative structure. D I Yogyakarta is governed by a sultan who is different from the governors in other provinces. Aside the Sultan, there is also the legislative body called *Dewan Perwakilan Rakyat Daerah* (Regional People's Representatives Assembly) which is democratically elected. The province just like other special provinces has its own flag, anthem and specific laws. The province is sometimes referred to as Daerah Istimewa (DI) or Dista Yogyakarta. The total surface area of the Province is 318,580 ha (3,185.80 km^2).

Table 3-3 Administrative structure in Indonesia

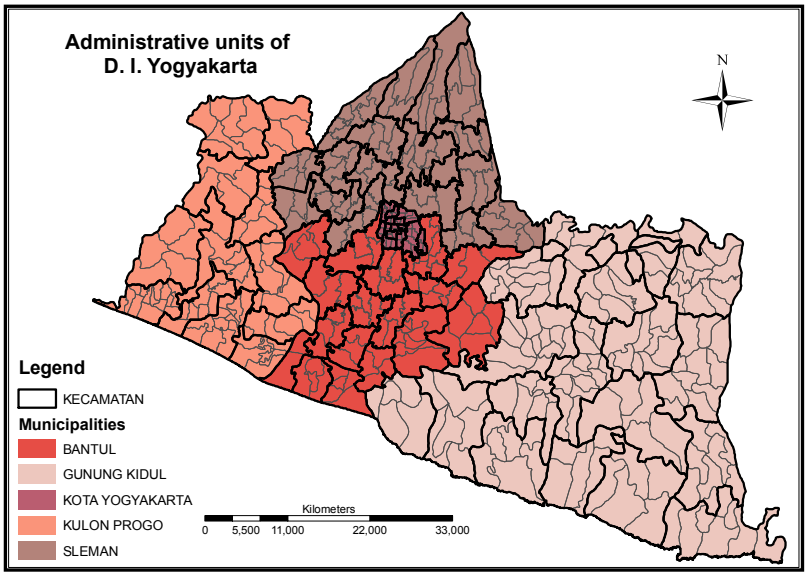
Type	Indonesia	Number	D. I. Yogyakarta	Head of Administration
Central Government	Pemerintah pusat	1	-	President
Province	Propinsi	33	1	Sultan
Regency	Kabupaten	349	4	Regent
City	Kota	91	1	Mayor
Distict/Sub-district	Kecamatan		78	Camat

Village (rural/urban)	Desa/Kelurahan		438	Head of village

Source: Extracted from (BPS 2008)

The city of Yogyakarta is the capital of the province of Yogyakarta (see map 3-1). It is centrally located and bounded to the north and south by Sleman and Bantul regencies. Two other regencies located in the eastern and western parts of the province are Gunungkidul and Kulonprogo. These make up the four municipalities also known as regencies and a city belonging to the province of Yogyakarta. Of all the municipalities, Gunungkidul has the largest surface area of 50,686 ha (506.86 $Km^{2)}$ where as the city of Yogyakarta has the smallest surface area of 3250 ha (32.5 km^2). The municipalities and city are at par in terms of administrative powers but the former have larger areas and more agricultural than economic activities. The municipalities also have regents whereas the city has a mayor. The municipalities and city are obliged to provide public schools and health care facilities.

The next administrative level is that of the sub-districts. Sub-districts are located within a municipality or city and have heads that are directly accountable to the mayor or regent. They are sometimes referred to as districts in other provinces.



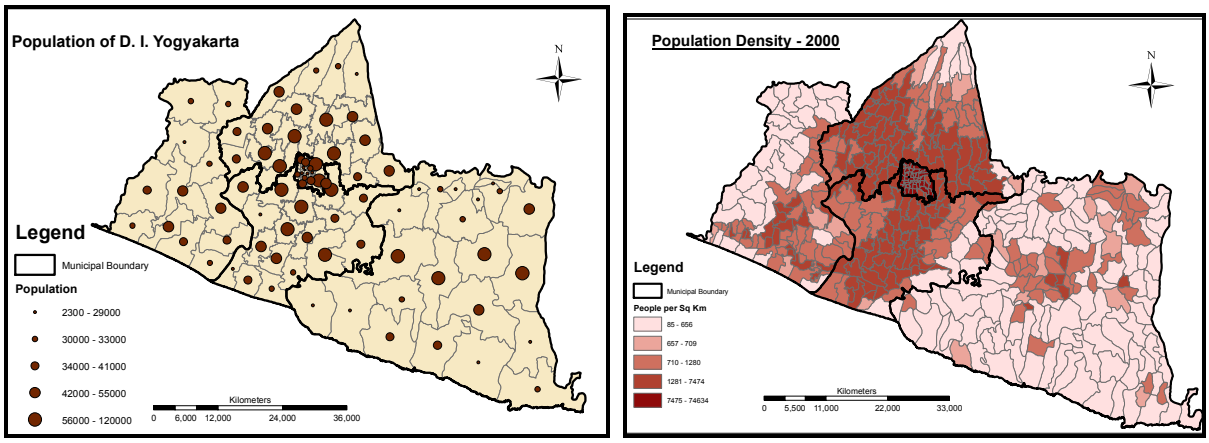
Map 3-1 Administrative units of DIY
Source: BPS dataset 2000

The final level is the village. A village is either called a *desa* or *kelurahan*. These are found within the sub-districts. A *desa* is a rural village with greater local responsibilities as compared to the *kelurahan* (urban village).

The province of Yogyakarta is endowed with some natural resources such as the rivers Code, Winongo and Gajah Wong. Trekking on Mount Merapi is a common activity for visitors. There are other architectural edifices that draw tourists and other foreigners to the province. It is a preserve of historically embedded Javanese culture and this differentiates the province from others. Mention can also be made of intellectual facilities such as universities and the like. The province has rail, road, air and water transport channels for transportation purposes.

3.3.1. Demography

The population of the province is about 3,300,000. The most populous area is Sleman with the least populous being Kulonprogo. Looking at the surface area of these municipalities, the city of Yogyakarta is the most populous with a high number of people per square kilometre (see map 3-2).



Map 3-2 Population and density maps of DIY
Source: BPS dataset 2000

The City of Yogyakarta and its surrounding areas have a dense population. The surrounding municipalities have less dense population. Though Municipalities such as Gunungkidul and Kulonprogo have bigger surface areas, their densities are relatively lower. The province has experienced tremendous growth in terms of population in over 30 years. The figure below summarises the population of the province since 1971.

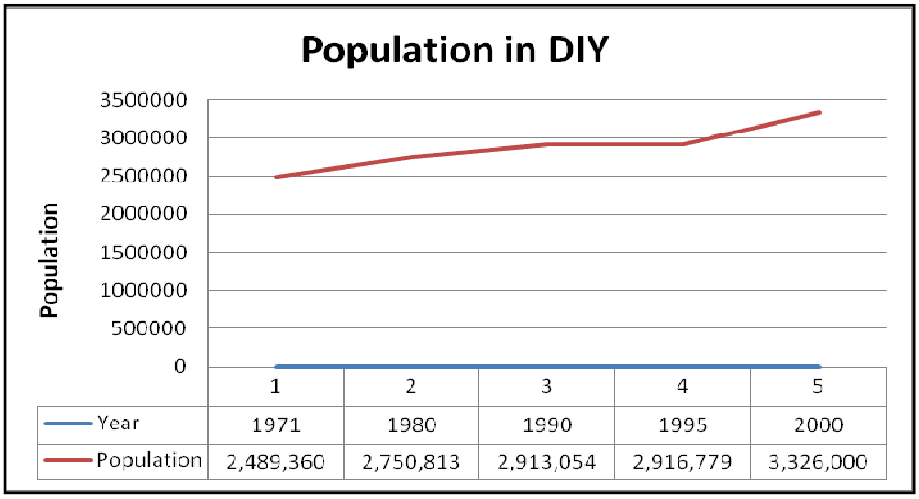


Figure 3-1 Population trend in DIY
Source: Extracted from (BPS 2008)

The municipality of Sleman between 1990 and 2000 has experienced a growth rate of 1.5% accounting for the highest rate in the entire province (BPS 2008). This phenomenon is supported by high population density in the municipality. All the municipalities have their own unique characteristics when it comes to demography.

3.3.2. Economic sectors and growth after crisis

The province has been less affected by the economic crisis of 1998 in general. It has recovered at a relatively faster rate. The pre-crisis period is marked by a constant growth in the Gross (Regional) Domestic Product (GRDP) between 8% and 4% in 1993 & 1997 (see figure 3-2). The GRDP falls by

11% which implies that the overall value of goods produced in the province is reduced in 1998. The post crisis period (year 1999+) shows an increase in the economic performance of the province with a steady rise in GRDP from 1%. The service sector is the largest contributor to the GRDP and is followed by trade and agriculture (now third due to declining performance). The sectors that have been growing fast are the finance and related sector as well the construction sector.

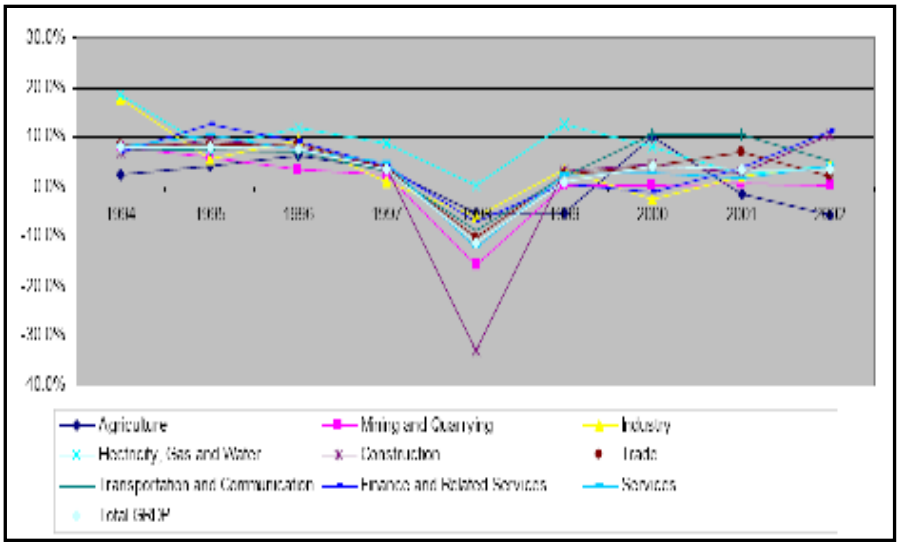


Figure 3-2 Annual sectoral & provincial GDP rate (1994-2002) *Source: (Special Province of Yogyakarta 2005)*

The main working sectors are: mining and quarrying, agriculture, forestry; hunting and fishery; manufacturing industry; electricity, gas and water; construction; wholesale trade, retail trade, restaurants and hotels; transportation, storage, and communications; financing, insurance, real estate and business services; community, social, and personal services.

Within the city of Yogyakarta, the service sector is the main generator of income. This is followed by trading, transportation, communication and financial sectors (Yogyakarta Municipality Report 2005). The sector contributing highly to the economic growth of the municipality of Sleman between 1993-2000 is the trade, hotel and restaurant sector i.e. the service sector (Sleman Municipality Report 2005). This is followed by manufacturing, financing and leasing, and the construction sectors. However, growth is relatively slow especially at the peak of the economic crisis (1998). The proportion contributed by all sectors for the entire province is shown below (figure3-3).

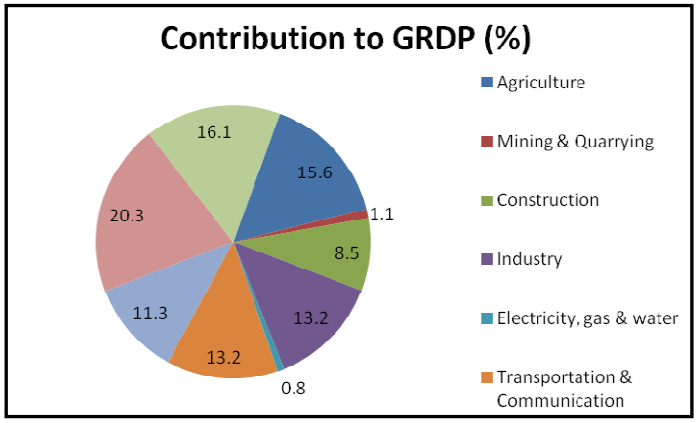


Figure 3-3 Contribution of economic sectors to GDP, 2002
Source: (Special Province of Yogyakarta 2005)

The finance and related services sector has been gaining prominence over the years and is the highest contributor to the GRDP in 2002. There has been a shift from agriculture to other sectors especially the secondary and tertiary economic sectors leading to tremendous growth in these sectors as well as a

large number of migrant populations who are employed in these sectors (Special Province of Yogyakarta 2005).

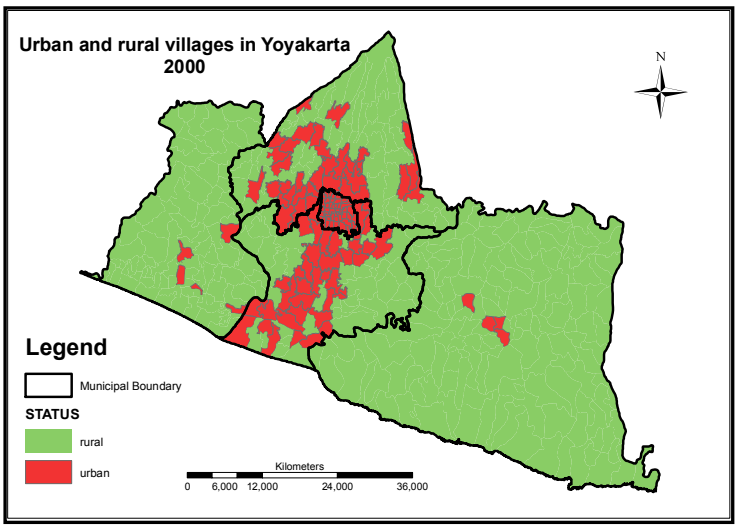
The shift from agriculture is attributed to the limited area of arable fertile land in the province. Fertile arable land is limited due to the reclassification of rural settlements into residential to accommodate urban expansion. This shift from agriculture has its setbacks; it has resulted in widespread unemployment and poverty though more migrants continue to flock into the province. However, in the less developed and less populated areas of Gunungkidul, the agricultural sector remains the main backbone of the municipality.

a. Life time migrants

In-migration to the DIY is seen as one of the main causes of population growth. Hitherto the year 2000, the out-migration is from DIY. However, since the year 2000, the destination is Central Java and specifically, DIY. The migrant age range is between 24-35 years with limited skills (Section for Early Childhood and Inclusive Education 2005). These do not have choices when it comes to jobs and they therefore work as labourers in factories.

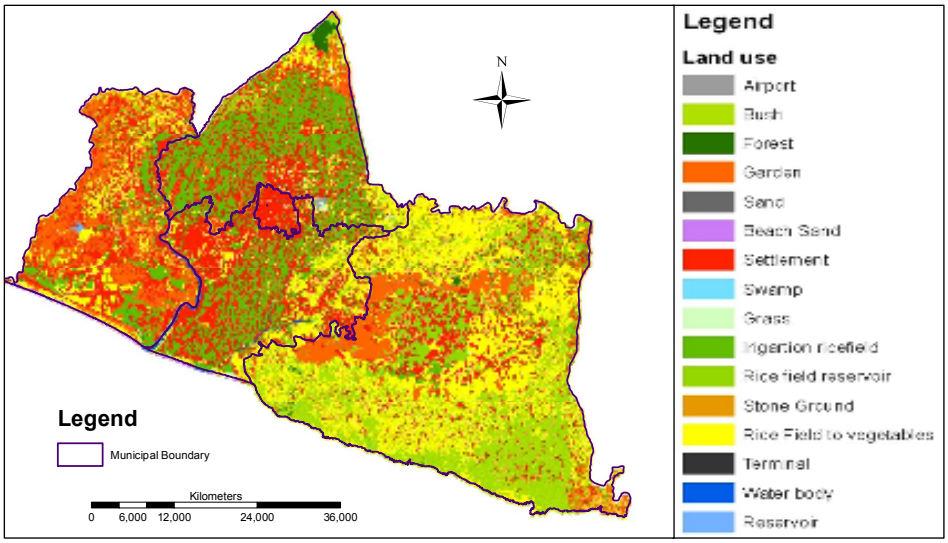
b. Land use

Two main land groupings exist in DIY. This is grouped into rural and urban land uses with others falling into preserved area. The preserved part encompasses natural resources such as the water catchment areas and the mountain range. Urban land uses are areas least dominated by agriculture and the reverse is true for rural land uses. There is however uncontrolled land conversion from agricultural to non-agricultural sectors. For the agricultural-dominated areas, various crops and livestock rearing activities take place. The figure 3-4 summarises the main types of land uses.



Map 3-3 Major land uses in DIY
Source: BPS dataset 2000

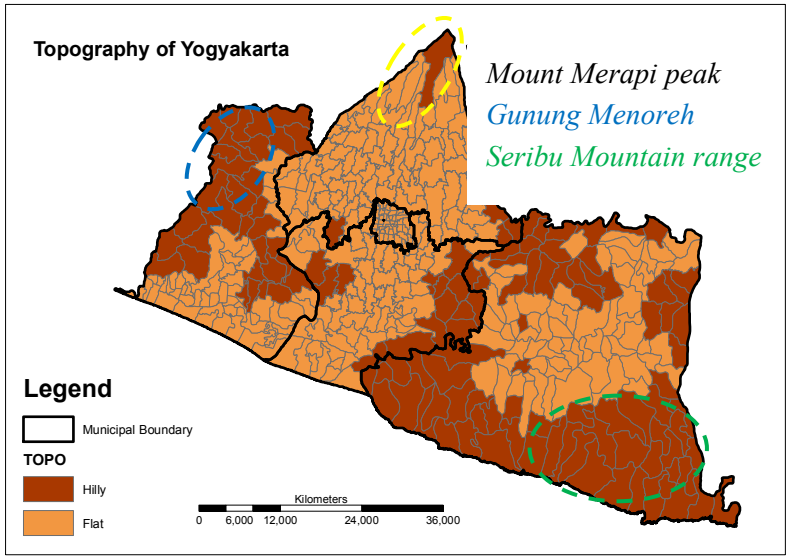
Aside the main types of land uses, the province is categorised into various land use types which cuts across the urban and rural areas (see map 3-4). These classes of land uses also show the dominance of rice and irrigation fields. The entire city of Yogyakarta is almost occupied by settlements with scanty rice fields. Stony and hilly areas are also shown in the western part of the province but are more evident in the topography map.



Map 3-4 Detailed land uses in DIY
Source: (PUSTRAL - UGM undated)

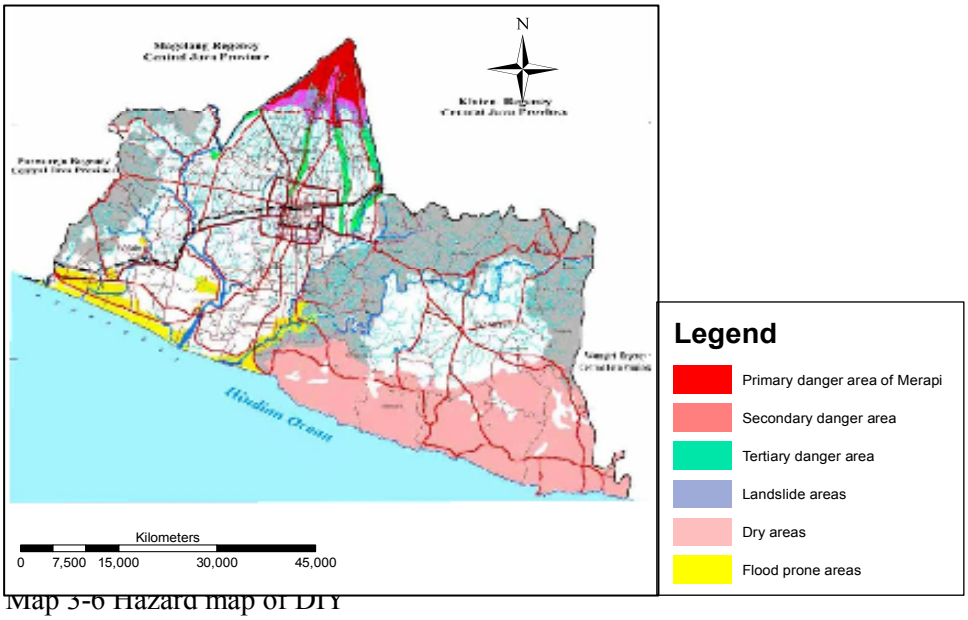
3.3.3. The topography of Yogyakarta

The province of Yogyakarta has an uneven terrain. It is either flat or hilly. The city of Yogyakarta is relatively flat but the highland areas come in at the peripheries of the province. The northern part of the province is towards the peak of Mount Merapi. The south-eastern hilly areas are part of the Seribu mountain range whereas the western part lies within the Gunung Menoreh mountain range.



Map 3-5 Topography of DIY
Source: BPS dataset 2000

The topography of Yogyakarta with its uneven terrain has some areas to be more hazardous than others. The map 3-6 gives an indication of this phenomenon.



Map 3-6 Hazard map of DIY

Source: Special Province of Yogyakarta (2005)

The major hazards are earthquakes, floods and tsunamis and dryness.

3.3.4. Health care & education policies and related shortcomings in the municipalities

Since the inception of the decentralisation policy, the Municipalities are in charge of providing and monitoring public services such as education and health care. These municipalities may delegate their oversight roles to sub-districts or other governmental bodies. In the provision of schools and health care, the governmental body in charge of standards and implementation is the Ministry of Settlement and Area Infrastructure. This ministry sets minimum standards for public health care and education. With a wide set of indicators which encompass health care provision and status, standards are prescribed and further explained to reduce any form of ambiguity or misinterpretation. The same applies to education. The table below is a summary of some minimum health care and education standards.

Table 3-4 Standard guidelines of minimum service level

SERVICES	INDICATORS	SERVICES' STANDARD	
		SCOPE	SERVICES LEVEL
a)Educational facilities	- Number of accommodated school age children - Distribution of educational facilities - Completeness of education facilities	- Neighbourhood unit with a population <30,000 persons	Minimum service level: - 1 unit kindergarten for 1,000 Residents - 1 unit elementary for each 6000 residents
a) Health care facilities	- Distribution of health care facilities/the coverage of health care services	- Neighbourhood unit population <30,000 persons	Minimum service level: - 1 unit medical house /3.000 persons

Source: Standard guidelines of minimum service level (2001)

In spite of the standard guidelines, each municipality has its own peculiar shortcomings with regards to health care and education provision. This is elaborated upon below based on the municipality reports (Bantul Municipality Report 2005; Gunung Kidul Municipality Report 2005; Kulon Progo Municipality Report 2005; Sleman Municipality Report 2005; Yogyakarta Municipality 2005).

Gunungkidul

There is quite a significant number of schools in Gunungkidul but the municipality is characterised by high rate of dropouts and low quality of human resources. Illiteracy is also relatively high.

However, health care is quite spread out over the area. Medical personnel are inadequate and some areas do not benefit from these services. It has the lowest supply of health care resources. Distance is seen as a barrier to the supply of health care.

Kulonprogo

This municipality is somewhat similar to Gunungkidul. It also has high number of schools with high numbers of dropouts and low quality of human resources. The unskilled nature of the human resource has made agriculture also dominant there.

In terms of health care, the municipality has a good health care status and adequate supply of health care in general.

City of Yogyakarta

The city has educational facilities for elementary and junior high school evenly distributed in all the sub-districts. However, there is the problem of inadequate infrastructure among others. Most of the tertiary institutions in the province are located in the city.

Health care on the other hand is relatively good though problems of inadequate health care facilities and personnel are still the orders of the day. That notwithstanding, the city has highly equipped medical facilities.

Bantul

Bantul is quite developed with elementary and junior high schools evenly distributed in all sub-districts. However, variations are encountered though mostly in the quality of the system and the infrastructure.

Health care wise, there is an improvement in the supply of facilities. It is rated as relatively good in comparison with the other municipalities. However the problem of inadequate health care personnel is pertinent.

Sleman

Sleman is a municipality that is currently improving economically due to the location of new universities such as the Indonesia Islamic University. However, the same problems of teachers and infrastructure characterise the area.

In the health care sector, improvement in the number of facilities over the years has improved health care in general. Aside the city, this municipality has very high quality health care facilities. However, population growth has an effect on the supply of health care in the area.

Summary: Education and health care provision are reported to be good in some municipalities such as Kulonprogo, Sleman and Bantul. The city of Yogyakarta and Gunungkidul face more challenges in terms of the number of health facilities. However the data is aggregated to the provincial level, averaging out real shortcomings among the villages. In order to bring out the actual provision level, this study uses data at the most disaggregated level possible; the village level.

3.3.5. Administrative levels & decentralisation policy

Decentralisation is defined by the Concise Oxford Dictionary as the *transfer of authority from central to local government*. The Indonesian Ministry of foreign affairs defines decentralisation as *"... a means to hand over political, financial and administrative authority from central to local (district/city) governments, so that the government can facilitate and guarantee better public services for the people. Decentralization ... should be viewed as a positive development to bring public services closer to the people*... (Darmawan 2008). Decentralisation is a practice currently ongoing in Indonesia.

a. Pre decentralisation

Indonesia gained independence in 1945 from the Dutch government. Hitherto independence, the Dutch traders established themselves and controlled a significant portion of Indonesia. They saw to the improvement of health care and education in the country though the educational system did not fully embrace the locals. They developed the potentials of the country (then Dutch East Indies). Within a short while, the country became the highest producer of quinine and pepper. It also contributed significantly to the production of tea, sugar, coffee and oil. All these notwithstanding, the people of Indonesia resented the colonial power and fought harder towards self government and finally elected its premiere president, Sukarno.

President Sukarno's government reigned until it was overthrown in 1966 by armed forces led by Suharto. A year later, Suharto became president until he had to resign in May 1998. During the reign of Suharto, the economy grew and flourished. More Indonesians had the privilege of being educated and there was improvement in health care as well. The latter part of his reign was fraught with corruption. He was said to be corrupt and he oppressed anybody who dared to say ill of his government. Provision of health care and education became centralised. The central government wielded so much power. Issues became heightened during the economic crisis that hit Indonesia and other Asian countries. This brought about a revolt and forced the second president, Suharto to step down. Since then, decentralisation has become the order of the day.

b. Decentralisation

Decentralisation is introduced in Indonesia with the passage of Law number 22/1999 on Regional governance and Number 25/1999 on Fiscal balance between the centre and the regions in May 1999. This brought down the highly centralised way of governing. It led to an overhaul of the role of the provinces and a restructuring of the administrative mechanism. This new system which was given a two year preparatory field changes the pattern of government substantially. It gives the provinces and local governments, far-reaching responsibilities for the provision of public services.

The figure 3-5 indicates the influence of the decentralisation system which has brought the duties of providing health and education closer to the people. The Central government no longer provides these services but the local government comprising the municipalities and villages.

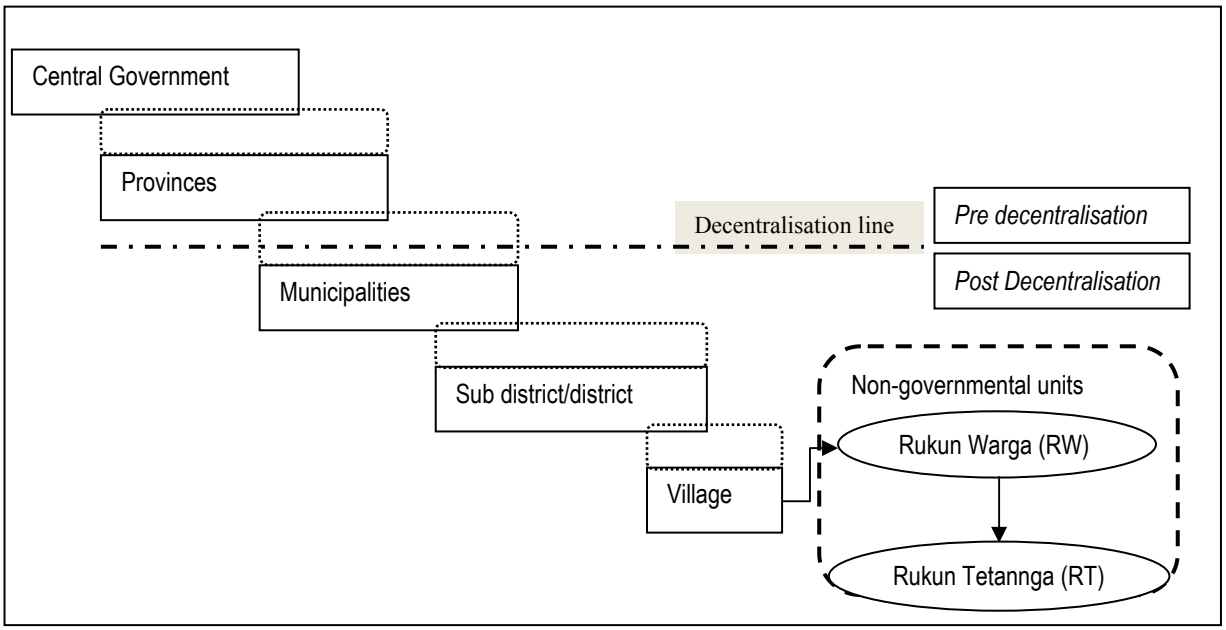


Figure 3-4 Administrative structure of DIY

Cohen and Peterson (1996) outline some advantages of decentralisation and this is further elucidated in a study in Indonesia (Darmawan 2008). Decentralisation is seen to promote political openness, public participation, tolerance, administrative and bureaucratic capacity as well as efficiency. The central government is no longer overburdened and is able to monitor the entire process adequately.

It is also envisaged as a mechanism to improve representation in terms of diverse political, ethnic, religious and cultural groups. It ensures that power is not one-sided and that a good representation of the local people is achieved. It ensures maximum participation from the public in the development process and also brings decision-making process closer to the people.

It is further believed to enhance effective distribution of public services. It creates a platform for citizens to collectively benefit from the national cake. Decisions are taken in lesser time which enables more projects to be completed on time for the betterment of the population. The local authorities are said to know more about the real needs of the people as against the central government and are able to meet their needs more efficiently.

c. Reinforcing decentralisation in public service delivery

The passage of the decentralisation law in Indonesia has brought about more community and stakeholder involvement in the management of health care and education. Decentralisation comes at a time when the economic crisis that hit Asia in the late nineties is still evident in various segments of the country. There is the need for further regulations to ensure total transition from the hitherto centralised system of providing health care and education to a more decentralised system.

The autonomy granted the local government expedites direct provision of health care and education to the local people. The bureaucratic centralised system took a longer time for effective decisions to be made concerning the provision of public services. This new system and its accompanied structure are less bureaucratic and decisions are taken at a faster pace since the decision on the quality and quantity of public services is shifted towards the local authorities and communities.

3.4. Summary

The chapter looked into the characteristics of the data used in the study by considering its source, availability and reliability. It highlights some limitations which are likely to manifest in the analysis and overall conclusions. The study area and some characteristics based on the geography, population and topography are also stated. It further looked into some policies on public services specifically health care and education by specifying their minimum levels of service. The decentralisation policy of Indonesia has brought the provision of health care and education closer to the people; its advantages and the need for improvement are spelt out as well.

4. Assessing provision of health care and education

4.1. Introduction

The broad aim of this chapter is to assess the level of public services specifically health care and education provision in the Province. Principal component analysis (PCA) has been used as a good way to undertake multivariate analysis and is used in the analysis. Its explorative nature and ability to reduce complex analyses into a simplified one makes it an ideal technique to evaluate the levels of health care and education provision in D. I. Yogyakarta. Health care provision indices are constructed to ascertain the level of health care. Further the chapter explores whether there is spatial clustering of service provision or otherwise. The analysis is done for all the villages for effective comparison.

4.2. Methodological approach

The methodological approach applied in the analysis of the provision of health care and education as well as the determination of spatial clustering is summarised in the figure below. Three main software tools are used; ArcGIS, GeoDa, and SPSS. Indicators are used in the raw state unless it is not comparable across villages for which case the ratio of a variable to the population is computed.

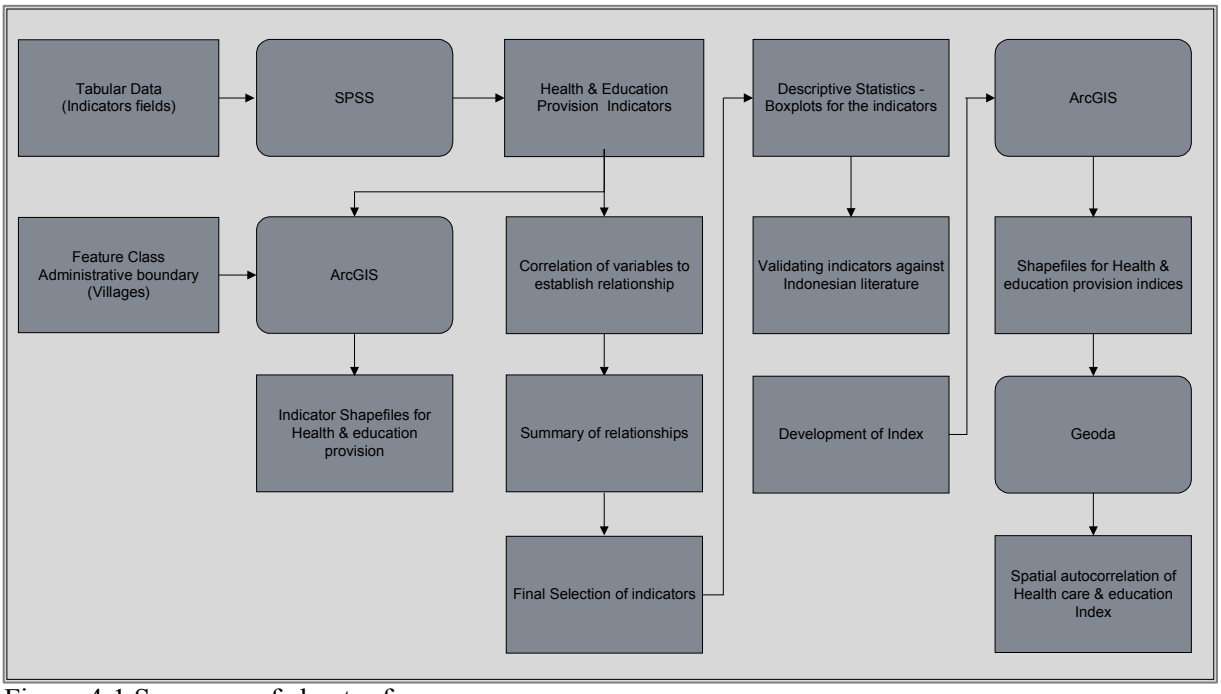


Figure 4-1 Summary of chapter four

Secondary data is from the BPS national population census of 2000. The base map is the administrative boundary of Yogyakarta which is from Center for Transportation and Logistics Studies in Gadjah Mada University (PUSTRAL – UGM). Data from the BPS survey is exported into SPSS from Microsoft office access database (*.mdb). With no unique identity (ID), a unique ID is created which makes it possible for the base map to be joined to the tabular dataset. Prior to the join, a unique

ID field is created for the tabular data as well. The IDs are created by sorting the municipalities, sub-districts and villages in ascending order simultaneously and maintaining this structure for all tabular data and base map. A new column is added to give each village a number which makes it unique.

The tabular data is explored in SPSS so as to determine the variables that could be useful for assessing provision of health care and education in the context of Yogyakarta. The exploration is done via correlation and descriptive statistics like measures of central tendency. The final selection of indicator variables is made based on the relationships identified in the exploratory phase and compared with Indonesian literature such as Futoshi, Shyamal et al. (2007). Selected indicators are then visualised in ArcGIS.

This study uses the Quantile scheme of classification for visualisation purposes unless otherwise stated. The Quantile scheme is useful for the exploration of cases in an understandable way as it groups similar cases together in such a way that each class contains similar number of cases. It is useful for grouping data into quintiles and deciles so that changes in middle values are easy to detect in the map. This analysis makes use of quintiles to evaluate the level of service provision in the villages with the indicators under question.

The indicators of health care provision are used to calculate indices of health care provision. These indices give an overall insight on the provision of health care in Yogyakarta. However for provision of education, no index is derived as the indicator for analysis is one. Based on the developed indices and the indicator of primary education provision, spatial clustering is explored.

The next section describes the indicator variables that are considered and those finally used in the construction of the indices.

4.3. Selection and description of indicators

This section looks into all indicator variables considered and the process leading to the final selection of indicators. The first part deals with the description of indicators of provision of health care and the latter part deals with that of provision of education. The final selection of indicators takes into consideration the work of Futoshi, Shyamal et al. (2007) he lists distance and population per facility as key indicators of health care provision in Yogyakarta.

4.3.1. Provision of health care

There are about eleven kinds of health care facilities counted in the 2000 dataset of Yogyakarta. These include regional, municipal, district and village health care facilities. Of these, three are provided by the government at the village level. These include health centers (also Sub-puskesmas); maternity clinics (Polindes) and village medicine post (Pos Obat Desa). These three village level health care facilities are the objects of study for this research. The figure 4-2 shows some examples of health centers as well as an integrated health center which is at the sub-district level. The indicators associated with them are explained further below.

Figure 4-2 Integrated health cares and health centers

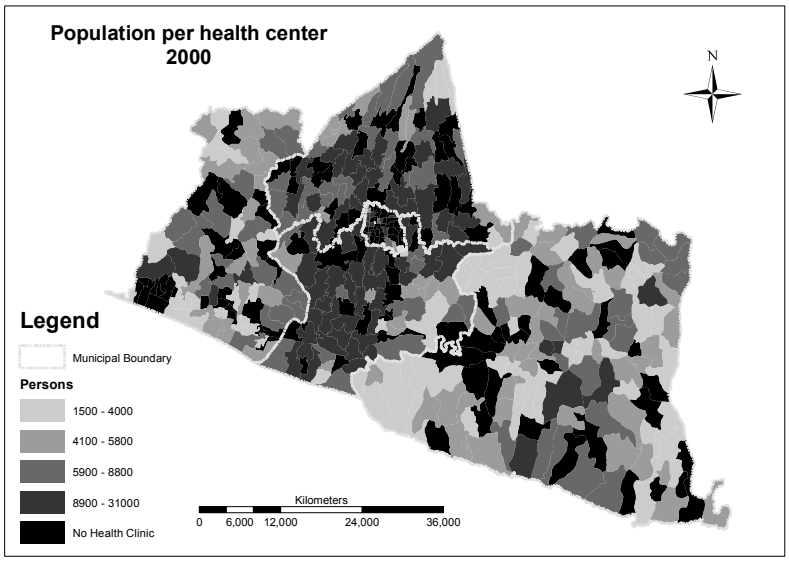
In order to assess variations in health care provision across the villages, two main indicators are derived for each health care facility. For the three health care facilities, a total of six indicators are derived. The indicators of health care provision are:

1. Population per health center
2. Distance to health center
3. Population per maternity clinic
4. Distance to maternity clinic
5. Population per medicine post
6. Distance to medicine post

a. Population per health center

A health center is a village-level health care facility that provides integrated health services; detection and early intervention for growth and development, eradication of communicable diseases, advisory services for nutritional improvement and family planning, etc (Surbakti, Praptoprijoko et al. 2000). Skilled Midwives are sometimes employed for maternity care purposes.

This indicator measures the availability of health centers. It is computed by dividing the total population of each village by the number of health centers there. The quantile classification is used to generate four classes so as to highlight areas without health centers. This indicator shows the variations pertaining to the population sharing a health center across the villages. It also highlights more people (up to about 31,000 persons) sharing health centers in the central and north-south parts of the province. Villages without centers are also shown to spread across the province.

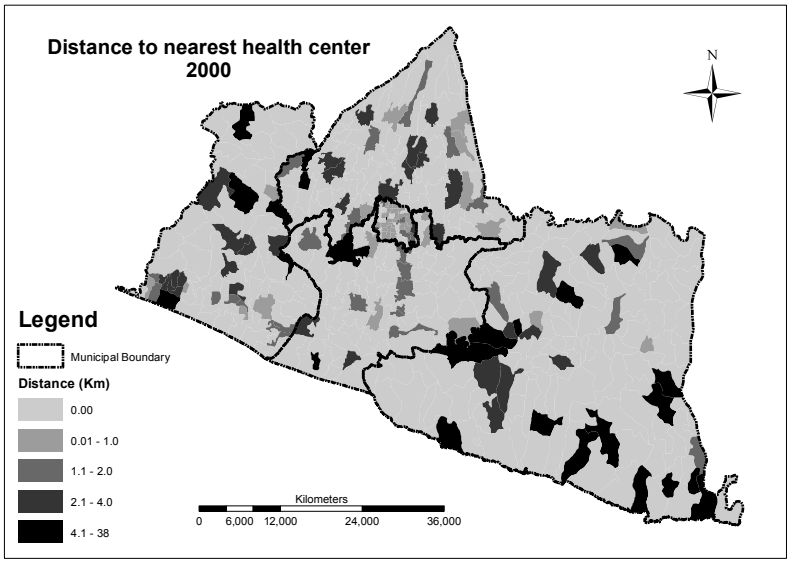


Map 4-1 Population per health center
Source: Author's calculation from BPS dataset 2000

b. Distance to health center

This indicator measures the distance to the nearest health center from a village. The raw values are in kilometres and used in such state. The map 4-2 visualises the distances to health centers across the villages.

The central portion of the province has distances ranging between 0 and 4km. Other areas of the province indicate some villages having distances up to and including 38km.



Quin	Population (%)	Rural (%)	Urban (%)
A	67	63	37
B	14	15	85
C	7	45	55
D	8	50	50
E	4	100	

Map 4-2 Distance to health center
Table 4-1 Population characteristics per quintile
Source: Author's calculation from BPS dataset 2000

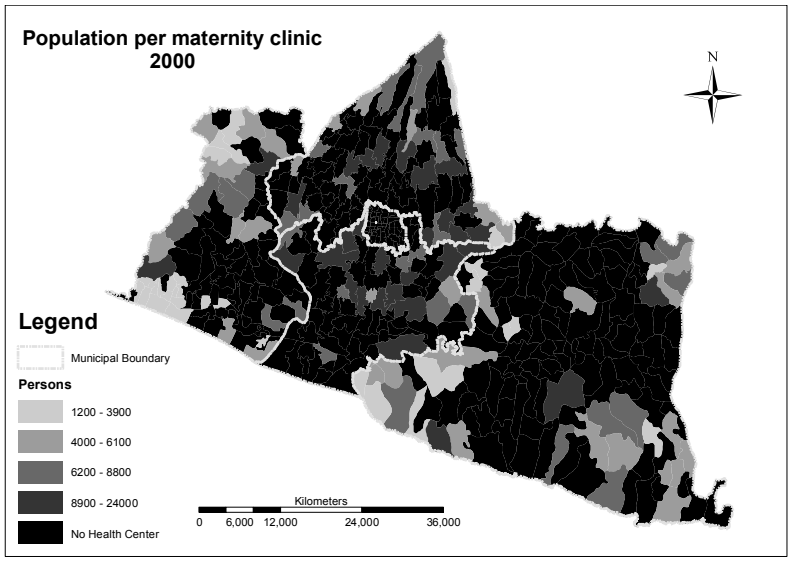
The results from table 4-1 indicate that about 67% of the provincial population are found in villages with health centers. This quintile (*Quin*) A corresponds to the areas shown in the first quintile of map 4-2. Out of this figure, 63% of the population are found in the rural villages as against 37% in the urban villages. The results also show that about 4% of the provincial population fall within 4-38km of the nearest health center. The population within the longest distance are all found in the rural villages.

This section has illustrated that more than half of the population are found in villages with health centers and the remaining population are within 38km of the nearest health centers.

c. Population per maternity clinic

Maternity clinics are provided by the government to give obstetrical care and information to pregnant mothers. The personnel attend to children as well and sometimes treat adults for malaria and other illnesses. It may be headed by a village cadre[1] (Surbakti, Praptoprijoko et al. 2000).

This indicator measures the availability of maternity clinics. The computation is done by dividing the total population of each village by the number of maternity clinics there. The map 4-3 gives an indication of the variations in this indicator. It shows quite a lot of villages not having maternity clinics especially in the eastern part of the province as well as the city. The north-south portion also show more population sharing a maternity clinic with some areas as high as 24,000 persons sharing a maternity clinic.

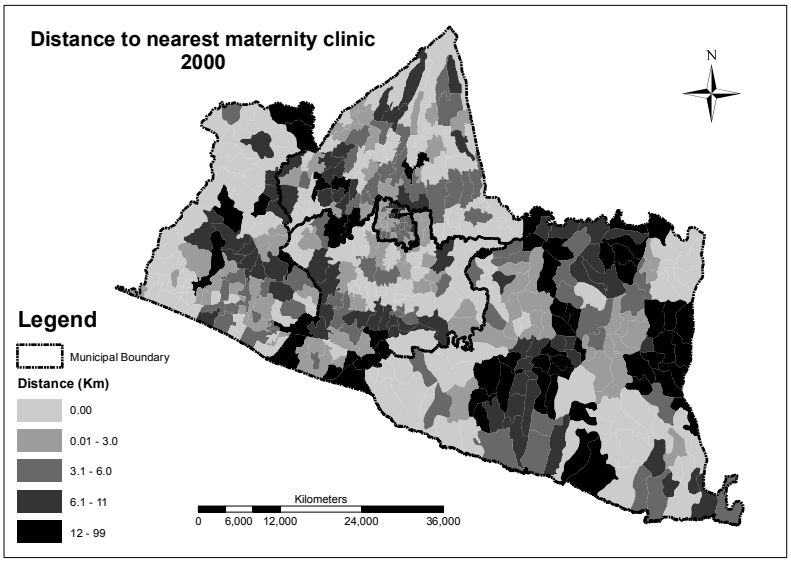


Map 4-3 Population per maternity clinic
Source: Author's calculation from BPS dataset 2000

d. Distance to maternity clinic

This indicator measures the distance to the nearest maternity clinic from a village. The raw values are in kilometres and used in such state. The map 4-4 visualises the distances to maternity clinics across the villages. Villages on the eastern and western parts of the province are far from the clinics with some as far as 99km from the nearest maternity clinic.

[1] Cadres encompass village volunteers who are trained to assist with specific duties in the clinics and POD. The duties may include providing advisory services on family planning, malaria prevention, immunisation, sanitation, etc.



Quin	Population (%)	Rural (%)	Urban (%)
A	26	80	20
B	24	40	60
C	20	40	60
D	17	51	49
E	13	64	36

Map 4-4 Distance to maternity clinic

Table 4-2 Population characteristics per quintile

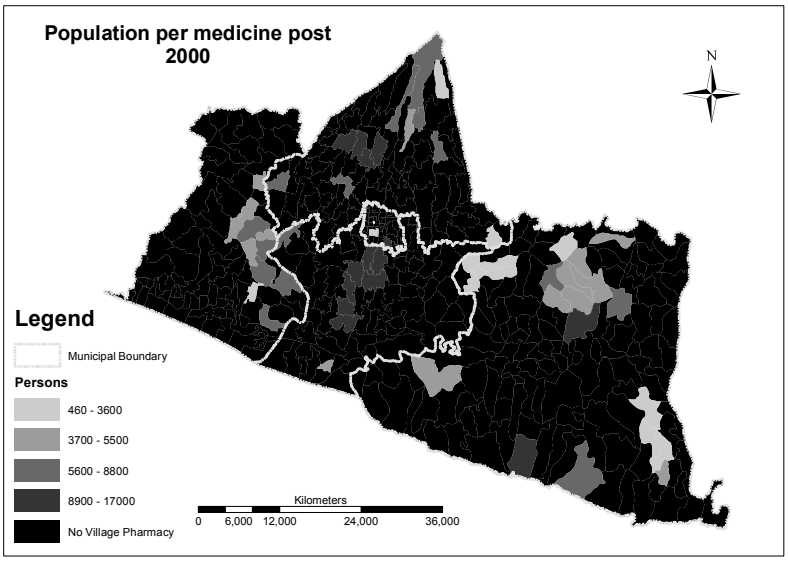
Source: Author's calculation from BPS dataset 2000

The results also indicate that about 26% of the population are in villages with maternity clinics (table 4-1). The urban population makes about 20% of the population in villages with maternity clinics. 50% of the provincial population are over 3km away from the maternity clinics. This shows that the rural population have more clinics at their disposal as compared to the urban population.

e. Population per medicine post

Medicine posts on the other hand are provided by the government to offer treatment for basic illnesses and infectious diseases. General sales list medicines (GSL) also known as Prescription only medicines (POM) as well as Over-the-counter medicine are available there (Surbakti, Praptoprijoko et al. 2000).

This indicator measures the availability of medicine posts by dividing the total population of each village by the number of medicine posts there. With the exception of the class with no medicine post, all other classes (quintiles) are based on the quantile classification. A lot of the villages do not have medicine posts. Those villages having medicine posts have quite a lot of people (up to about 17000 persons) sharing a post (see map 4-5).

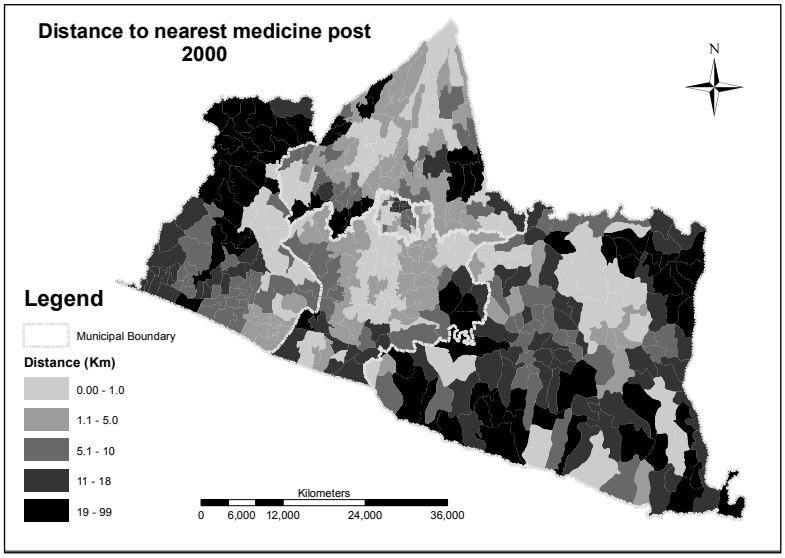


Map 4-5 Population per medicine post

Source: Author's calculation from BPS dataset 2000

f. Distance to medicine post

This indicator measures the distance to the nearest medicine post from a village. Values are in kilometres and are used in such state. The map 4-6 visualises the distances to medicine posts across the villages. Villages on the western part are further away as compared to the north-south villages. The farthest village is about 99km from the nearest post.



Quin	Population (%)	Rural (%)	Urban (%)
A	26	41	59
B	23	51	49
C	21	51	49
D	16	68	32
E	14	81	19

Map 4-6 Distance to medicine post

Table 4-3 Population characteristics per quintile

Source: Author's calculation from BPS dataset 2000

The corresponding table 4-3 shows population fairly distributed in each distance quintile. The results show about 26% of the population is within a kilometer reach of a medicine post. The longest range of distance is between 19 and 99km and 14% of the provincial population fall within. Of the 14%, the rural population is higher (81%).

g. Other Factors

This section indicates other factors which are ideal for variation studies concerning health care provision however, data constraints made it impossible for them to be considered in this study.

Ease of reaching health facilities

This indicator measures the ease of reaching the nearest health facility from a village. It ranges from easy to difficult. Data is available but its usage will influence the results of the analysis as the values are different from the rest of the indicators used. Thresholds for establishing level of difficulty are also not available. This made it difficult for the data to be translated into a useful measure.

Doctor Patient Ratio

The doctor patient ratio is a good indicator of the quality of health care rendered to the people. However, data is unavailable for this analysis. The dataset shows only the presence of health care personnel such as doctors, paramedics, midwives, etc without an indication of actual numbers per village. Using such an indicator would influence the results as the values are different from the rest of the indicators used. This made it difficult for the data to be translated into a useful measure.

The capacity of health care facilities

This gives an insight into the capacity of the health care provision and is also a proxy health care overcrowding indicator. However, data on the sizes/capacities of the health care facilities are not available in the dataset.

4.3.2. Exploring and selecting indicators

All indicators of the provision of health care are used in a correlation analysis to identify the strength and direction of any relationship (see appendix 9). All the indicators showed some amount of correlation which means that the relationship could be further explored in a higher dimension. The indicators of population per health center, maternity clinic and medicine post were negatively correlated with their associated distances. This indicated that villages with higher numbers of people per the various health facilities were associated with shorter distances to the various health facilities. Similarly, the population per the various health facilities were inversely related with the ease of reaching these health facilities. The implication being that all villages with higher numbers of people per the various health facilities experienced less difficulty in reaching the facilities.

Quite different from these results was the association between distances to health facilities and the ease of reaching the various health facilities. Distances to the various health facilities were positively correlated with the ease of reaching the health care facilities which suggests that the two sets of indicators may likely be measuring the same construct. Higher distances were associated with difficulties in terms of the ease of reaching the health care facilities. As there was no way of ascertaining the thresholds on the ease of reaching health care facilities, this indicator is dropped in the construction of the provision of health care indices. This is also because the distance related indicators have the same pattern or relationship as the ease related indicators. Further analyses were done to ascertain the level of health care provision with the use of *distance* and *population per health facility* indicators. Indices are developed for comparison of health care provision across villages with the use of Principal Component Analysis (See section 2.5.7) in SPSS.

4.4. Development of health indices

Provision of health care is further assessed by the use of indices developed from principal component analysis (PCA). The indices show in general terms, variations in the provision of health care.
For health care, two indices are constructed. These include:

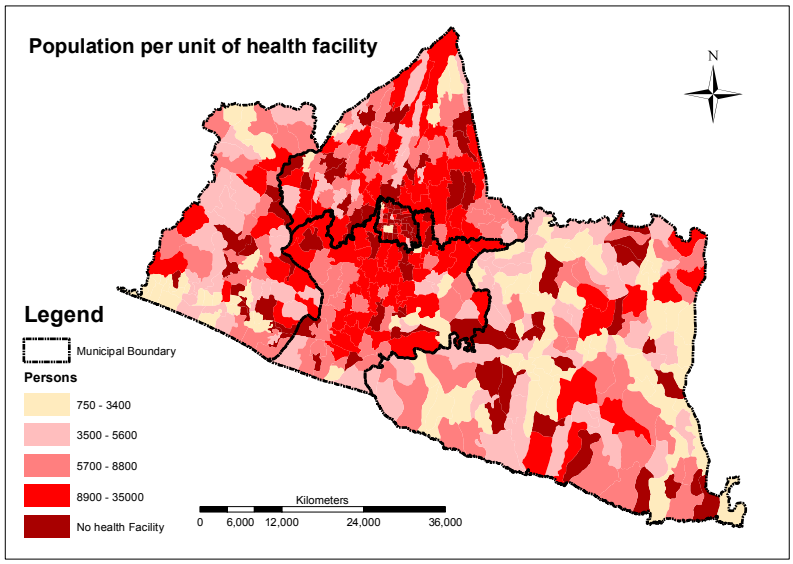
- *Index of population per health facility*
  This index measures as a whole the population per health facility. In order to develop this index the three indicators of population per health center, maternity clinic and medicine post are used in PCA to generate weights which are summed into an index. The analysis generated one component which explains about 45% of the variation in the dataset. This implies that the net effect of each indicator variable on the total variance of indicators when maximised is about 45%. Hatcher (1994) explains that there is no formal threshold however, the higher the contribution on the component, the more acceptable it is. The method of summation is listed below:

  Index = He_PopHCen*(0.760) + He_PopMCli*(0.638) + He_PopMPos*(0.607)
  Where; *He_PopHCen = Population per health center*
  He_PopMCli = Population per maternity clinic
  He_PopMPos = Population per medicine post
- Index of distance to the nearest health care facility

This index is developed to measure the overall distance to the nearest health facility. Weights are generated from PCA to sum the distance related indicators into an index. The summation is shown as follows:

Index = He_DistHCen*(0.148) + He_DistMCli*(0.786) + He_DistMPos*(0.789)
Where; *He_DistHCen = Distance to nearest health center*
He_DistMCli = Distance to nearest maternity clinic
He_DistMPos = Distance to nearest medicine post

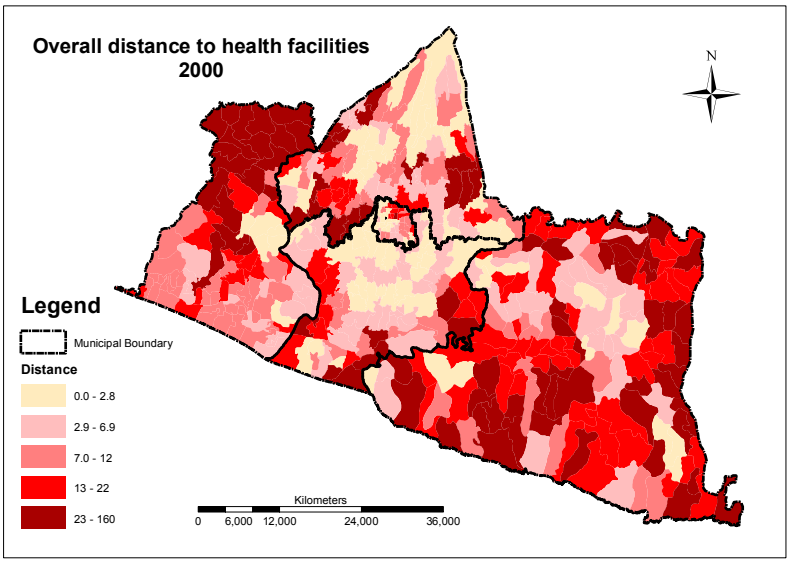
The maps below are indicative of the results of the developed indices.



Map 4-7 Population per health facility index
Source: Author's calculation from BPS dataset 2000

From the map, the population to a health facility in the center and north-south municipalities is relatively higher as compared to the municipalities in the western and eastern parts of the province. This may be attributed to the relatively less population density in the western and eastern areas as compared to the central and north-south areas. The index shows the unavailability of health facilities in the central portions of the province as compared to the western and eastern municipalities. The distribution of villages with no facilities in general is fairly spread over the entire province.

With the exception of the class with no health facility which is created for emphasis, the quantile classification is used to create classes.



Map 4-8 Distance to health facility index
Source: Author's calculation from BPS dataset 2000

This index shows the central portion of the province as well as the northern and southern municipalities as having shorter distances. The western and eastern municipalities of the province have longer distances. In order to reach a health facility, villages in the eastern and western municipalities have to travel in general over 23km. Such villages are mostly in the hilly areas with less road networks (Special Province of Yogyakarta 2005).

This section has looked into the overall health care provision of the province and the results show the less availability of health care in the central portion of the municipality as well as the northern and southern parts. Distance-wise, provision of health care is better in the central, northern and southern municipalities.

4.5. Spatial clustering of health care provision

Having identified the variations in the provision of health care, the study explores whether areas of similar health care provision are spatially clustered. This is done with GeoDa; a program for conducting spatial data analysis, geovisualisation, spatial autocorrelation and modelling (Anselin, Syabri et al. 2006). The analyses for the two health care provision indices indicate significant clusters of hotspots and coldspots. Hotspots on the one hand are concentrations of areas of lower health care provision. Coldspots on the other hand indicate a spatial concentration of higher health care provision.

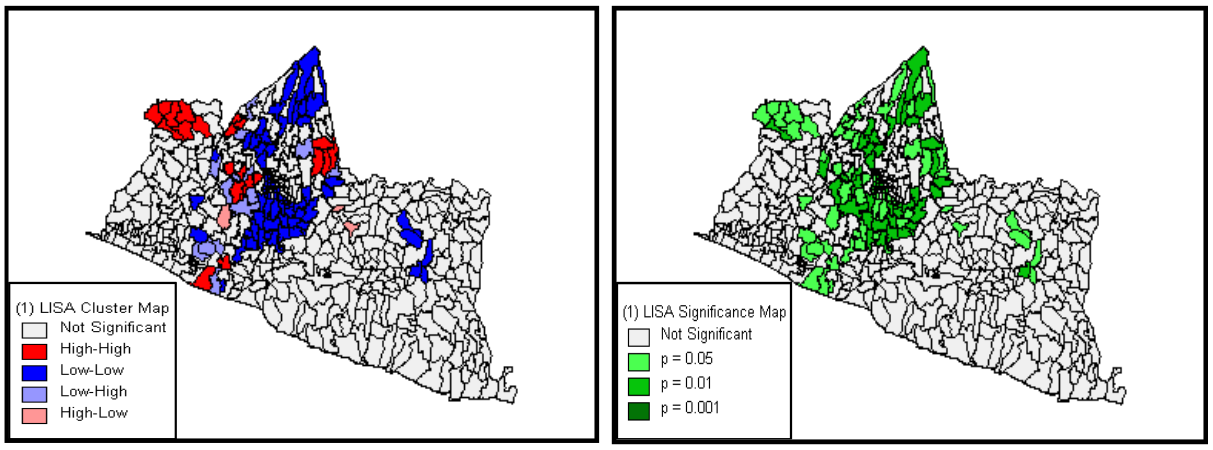
GeoDa uses the Global Moran's I as well as the Local Moran's I (Local Indicators of Spatial Association - LISA) in generating results. The Global Moran's I is useful for identifying a clustered, dispersed or random pattern in general. This is revealed when the statistical significance is near positive or negative one (+1 or -1). A Global Moran's I of one (1) indicates strong spatial autocorrelation or perfect correlation (clustering of similar values) whereas negative one (-1) indicates a strong negative spatial autocorrelation or perfect dispersion (a checkerboard pattern). A moran's I of zero (0) indicates a random pattern, no association or spatial randomness.

The statistical formula is below:

$$I = \frac{N}{\sum_i \sum_j W_{ij}} \times \frac{\sum_i \sum_j W_{ij}\left(y_i - \bar{y}\right)\left(y_j - \bar{y}\right)}{\sum_i \left(y_i - \bar{y}\right)^2}$$

Where,
N = number of units
y_i = the attribute value for each unit i
W_{ij} = the weight or connectivity for units i and j.

The Global Moran's I tends to average local variations by assuming homogeneity of the whole study area. It gives one value for the entire province as an indication of the degree of spatial clustering without showing spatially where the clustering is, prompting the usefulness of LISA. LISA enables the visualisation of the clustered or dispersed areas. This is indicated by the high-high and low-low as well as the high-low and low-high values. High-high clustering shows that villages of lower health care provision are spatially close to one another. Low-low clustering shows that villages of higher health care provision are located closely to one another.



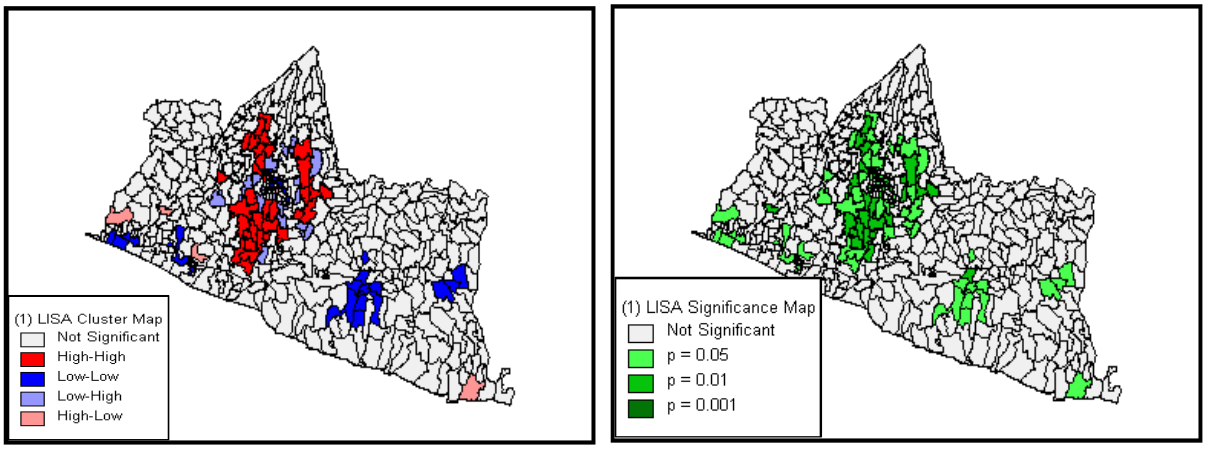
Map 4-9 Spatial clustering of distance to health facilities index and significance map
Source: Author's calculation from BPS dataset 2000

Spatial clustering is first done for the *Distance to health care facility index* using rook contiguity. The Global Moran's I is 0.2390 which shows the possibility of clustering. The LISA map is used to support the result of the Moran's I and it shows clustering mainly in the north-south direction. There is a clustering of areas of low level health care provision (high-high[2]) mainly in the north-western part as well as the fringes of the central part of the province. Villages having similar, low level health care provision tend to be located by one another. There is spatial clustering of coldspots i.e. high level health care provision in the north, some parts of the east and south-central portions of the province. Some few villages along the north-south areas show the existence of low-level provision areas neighbouring high level provision areas (high-low) and vice versa. A greater part of the map show a random pattern which is indicated by the colour white. This random pattern illustrates those areas as not showing any identifiable spatial pattern. The certainty of the clustering is shown in the

[2] High refers to a spatial clustering of high distances which is tantamount to low level provision.

significance map. The outer parts of the clustered areas show more uncertainty in the clustering of villages of similar health care provision.

The *Population per health facility index* is next to be explored and the map 4-10 gives an indication of the clustering.



Map 4-10 Spatial clustering of population per health facility index and significance map
Source: Author's calculation from BPS dataset 2000

The *Population per health facility index* shows a Moran's I of 0.1837. This gives a low possibility of spatial clustering therefore the LISA map is necessary to highlight any likely hotspots/ coldspots. The fringes of the central part of the province show a spatial clustering of lower level health care provision. This implies that spatially, villages having lower levels of health care provision are found closer to one another in that part of the province.

On the flip side, there exist some villages of higher level health care provision clustered in some parts of the eastern and western parts of the province. These villages also have similar level of health care provision. The degree of uncertainty associated with the spatially clustered areas tends to reduce mostly in the eastern and western parts as evidenced by the significance map.

In conclusion, the presence of spatial clustering of similar levels of health care provision implies the need for spatially targeted policies that seek to reduce distances in the villages seen as hotspots as well as reduce the number of persons per health facility.

4.5.1. Provision of education

There are various kinds of educational levels in Yogyakarta. The formal levels include kindergarten, primary, junior and senior high and the academy or university. These levels comprise a six year primary education, three years of junior secondary and another three years of senior secondary and finally, four years higher education. In Indonesia, there is currently a policy that seeks to encourage free compulsory basic[3] education (Section for Early Childhood and Inclusive Education 2005). The policy is also in consonance with the millennium development goal of achieving universal primary education for all. The Indonesian government puts emphasis on primary education. This study therefore looks into indicators associated with the provision of primary education in Yogyakarta.

[3] Basic education refers to education from the primary to the junior high school.

a. Population per facility

This indicator is based on the population per count of primary facility. The computation enables the indicator to be comparable across the villages. Ideally, the number of children of primary school age per unit of primary school would have been an appropriate indicator but inadequate data on the number of children of school going age makes this an adequate indicator (Futoshi, Shyamal et al. 2007).

b. Other factors

This section indicates other factors which are ideal for variation studies into primary education provision but are not used in this study because of data constraints.

Ratio of teachers to children

This is an indicator on the availability of primary education provision. This indicator is useful for such a study but it is unavailable in the dataset of BPS.

The size of primary facilities

This indicator gives an insight into the capacity of primary schools and is a proxy overcrowding indicator. However data is not available for this indicator.

Travel time to the nearest primary school

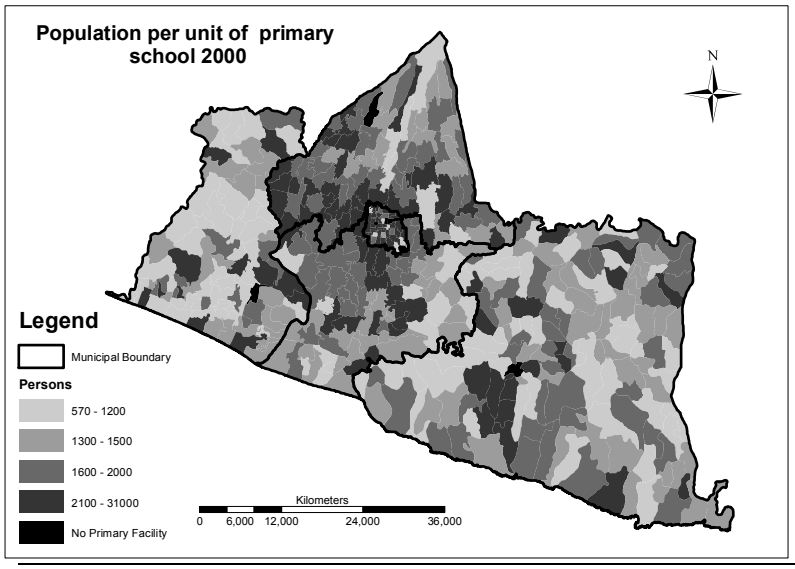
This indicator is measured in hours. The travel time is zero if there is at least one facility in the village. Where there is no facility in the village, the travel time is computed from the village midpoint to the nearest primary facility in another village.

Distance to the nearest primary school

This indicator is measured in kilometers. The distance is zero if there is at least a facility in the village. The distance is computed from the village midpoint to the nearest primary facility in another village if there is no facility in the village. However the distance is zero for all villages.

4.5.2. Exploring data for relevant indicators of primary education provision

For the level of provision of primary education, the indicators of population per school, distance and travel time are analysed in a correlation analysis. This however yielded null values indicating that two out of the three indicators showed no variations. Looking at the data, there were no values for travel time and distance as almost every village had at least a primary school. The travel time and distance to the nearest primary school are therefore discarded from any further analysis because they show no form of variation.



Therefore in assessing variations in the provision of primary education, the population per primary school is used solely. There was no need for an index to be constructed because only one indicator is used. The map 4-11 summarises the variations of the indicator.

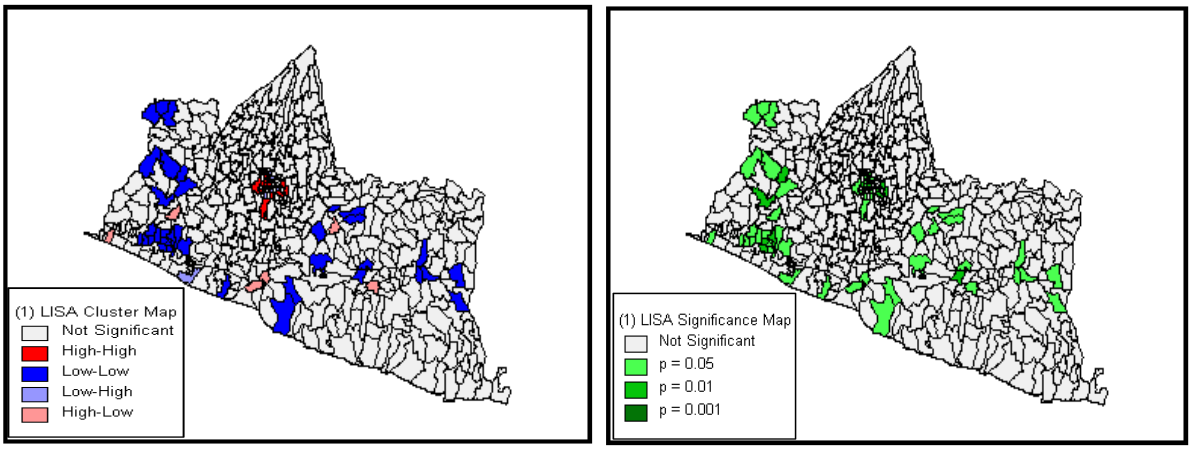
Map 4-11 Population per primary school

Source: Author's calculation from BPS dataset 2000

The map 4-11, using the quantile interval except the *no facility* class, shows almost all villages as having at least a primary school. However there is more pressure on the number of persons sharing a primary school around the central part of the province than in the western and eastern municipalities of Yogyakarta. There are some primary schools in the western and eastern municipalities for which the number of people sharing is seen to be very high about (31,000 persons). The national standard average is a primary school for every 6000 persons (see table 3-4). This national average is exceeded by far (up to 31000 persons) especially amongst the villages in the city of Yogyakarta. Very few villages do not have a primary school across the province.

Further analysis is done to identify the hotspots and coldspots of the level of primary education level via spatial autocorrelation/clustering. Spatial clustering of the various levels of education provision for relevant policy measures is conducted with Geoda and is elaborated upon below.

The population per count of primary schools is analysed. The result is presented in the map 4-12.



Map 4-12 Spatial clustering of population per primary school
Source: Author's calculation from BPS dataset 2000

The Global Moran's I of 0.1948 indicate the presence of clustering. The result is rather interesting as mostly villages in the western and eastern parts of the province show a clustering of high level provision of education (low-low) as compared to the city and its environs. The implication is that villages having the same high level of primary school provision are situated near one another.

There is also an indication of spatial clustering of hotspots. This is also seen by the clustering of villages of similar low level provision of primary school in the central part.

Spatial clustering of similar levels of health care provision implies the need for spatially targeted policies that seek to ease the pressure on the primary schools in the villages seen as hotspots. Also such areas may be identified for future policy priorities.

4.6. Relating health and education provision

The section identifies the nature of the relationship between health care and education provision. This is done in order to show if the provision of these services are associated in any way. The indices of health care provision; *Population per health care* and *Distance to health facility* are used in the

analysis whereas population per primary school is used as the education indicator. The health care indices and the education indicator are inversely related. This is to say that villages having higher provision of health care have lower levels of primary education provision whereas villages having lower provision of health care have higher levels of primary education provision.

It suffices to say that health care and education provision may not be equally high in any particular village as higher health care provision is associated with lower primary education provision.

a. Limitation of spatial analysis and constructed indices

This section highlights on what the study does not consider due to limited data as well as the extent to which the indices cannot be used.

- This study underscores that people only use services that are available to them within a geographically defined area such as the village.
- The indices of health care provision are measured in relative terms. A village having higher level of health care provision or found in the third highest class cannot be said to be twice better than the fifth class which refers to lower level of provision.
- The values of indices are directly incomparable but ranks are comparable.

4.7. Discussion on chapter four

This chapter looks into the assessment of the various levels of health care and education provision. This is achieved through Principal Component Analysis. This multivariate technique is useful for reducing data into a simple form and is used in this analysis to reduce indicators into an index. It is also useful for generating weights based on data at hand. For the analysis of the provision of health care indices, weights are generated in such a way that the author is able to avoid subjectivity in the analysis. The generated weights are then summed to generate the indices. The approach is also understandable and useful for generating general impressions of phenomena which in this case is the level of provision of health care and education.

The use of GeoDa adds a spatial twist to the analysis. Its simple interface makes it an ideal tool for spatial analysis. The software spatially identifies clusters that show villages of similar levels of provision by considering the conditions of neighbouring villages and the spatial characteristics between the two.

4.8. Summary of chapter four

This chapter looks into variations health care and education provision in the province by identifying and selecting relevant indicators of health care and education provision. The indicators of health care provision are further used to develop two indices which measure the overall level of health care provision. The level of education is assessed by the use of the indicator of population per primary school. Further analysis shows the presence of clusters of high level health care and education provision areas as well as low level heath care and education provision areas.

The study now looks into the socioeconomic position of these villages and this is further elaborated upon in the next chapter.

5. Assessing socioeconomic position

5.1. Introduction

This chapter looks into the assessment of the relative socioeconomic position of the villages. In determining the socioeconomic position (SEP) of the villages, studies such as Lahelma, Martikainen et al. (2004) and Vyas and Kumaranayake (2006) have indicated the need for using multiple indicators which cover various aspects of socioeconomic conditions instead of just an indicator. These studies emphasise on the use of indicators of deprivation as a means to determining SEP. This is because deprivation manifests in various forms and one indicator may not be a sufficient representation of the relative position of the villages. Principal Component Analysis (PCA) is used to develop indices of socioeconomic position. Prior to the development of the indices, all socioeconomic indicators are explored to select relevant indicators of socioeconomic position. The chapter further identifies whether there are spatial clusters of different socioeconomic position. The approach follows much the structure of chapter four.

5.2. Methodological approach

The analyses involve the use of three main software tools as seen in chapter four. The tools include ArcGIS, GeoDa and SPSS. The figure below illustrates the main steps of this chapter.

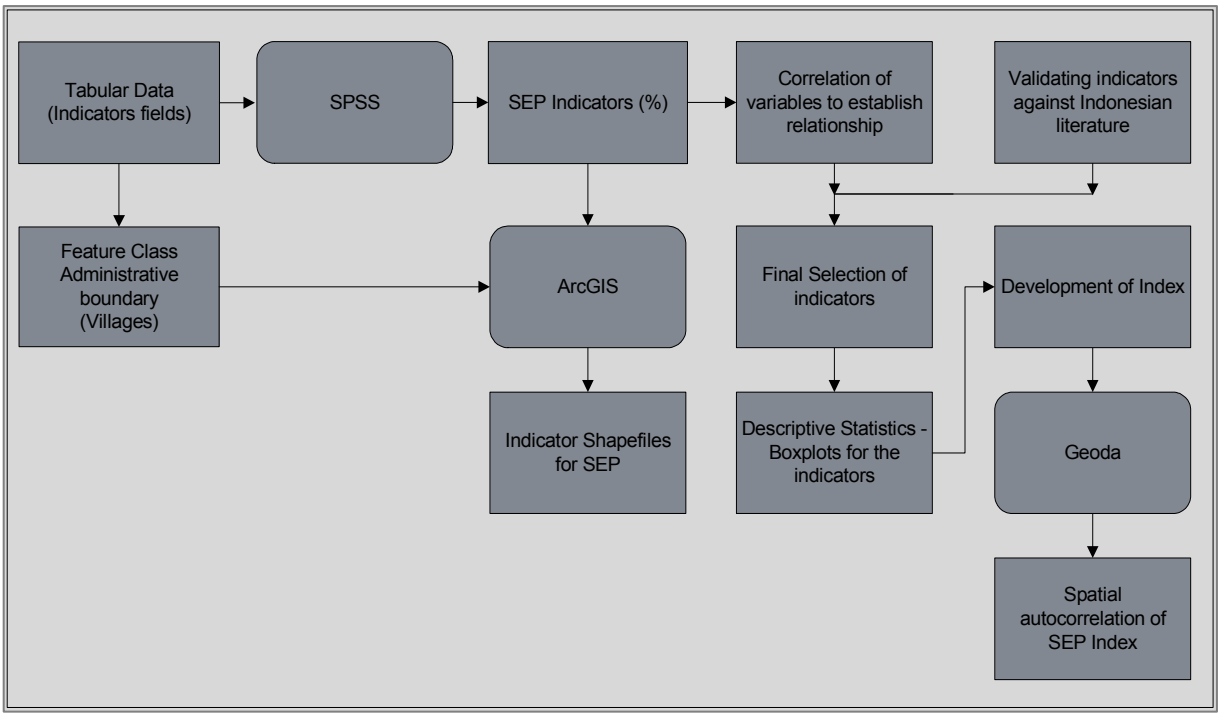


Figure 5-1 Summary of chapter 5

Two main types of datasets are used; base map and tabular census data from PUSTRAL- UGM and BPS respectively. Data are joined by the creation of unique identities for visualisation purposes. Also

for the same purpose of visualisation, the quantile interval of classification is used. This is done so as to generate equal number of cases (villages) in a class for further analysis.

The study initially explores 14 indicators of socioeconomic position and finally narrows down to 12 of them. This is done by considering literature in the context of Indonesia as well such as the work of Futoshi, Shyamal et al. (2007) and Witoelar, Sikoki et al (2009) as seen in chapter 2.

The indicators are used in PCA and four components are derived for the construction of socioeconomic indices. Using standard criteria for accepting components, two are finally settled upon as indices of socioeconomic position.

The section below elaborates on the indicators of socioeconomic position and the final selection of the indicators.

5.3. Selection and description of indicators

This section looks into all socioeconomic indicator variables based on the dataset and the process leading to the final selection of indicators. The section elucidates all indicators of socioeconomic position and concludes by highlighting those that are not used in further analyses.

5.3.1. Description of Socioeconomic Indicators

For the purposes of measuring the socioeconomic position of the villages, fourteen (14) village level indicators are studied prior to the selection of the final twelve (12). The fourteen description of the indicators stems from the works of Sumarto and Suryahadi (2001), Futoshi, Shyamal et al. (2007) and BPS (2008).

a. Poor households

There are four categories of prosperity in Yogyakarta. These categories are computed by the National Family Planning Coordinating Agency (BKKBN). They are: the Pre-prosperous household ("keluarga pra-sejahtera" or KPS), Prosperous I (KS I) to Prosperous III (KS III) indicating, very poor, poor, moderate and prosperous in that order.

Data is available on the number of households that fall within the very poor and poor groups summarised into a group called the poor. The criteria for these groups are as follows;

a. Pre-prosperous family refers to one which is unable to meet one or more indicators that include:
   Indicators: eating twice or more a day, having a different outfit for activities (e.g. at home, work / school and travel), the largest floor of the house is not ground.
b. Prosperous family stage 1 refers to a family which is unable to meet one or more indicators that include:
   Indicators: at least once a week the family eats meat or fish or eggs, new set of clothing for the whole family within the last one year, house floor area of at least 8 m^2 for each family member.

This indicator is useful for SEP studies and the households that fall within these categories are summarised as a percentage of the total households in the village.

b. Health care insurance for the poor

This is one aspect of the Indonesian Social Safety Net (SSN) program. It dates back to 1994 to alleviate the adverse effect of health care user fees on poor people. This health care insurance is issued to households identified as poor based on the BKKBN categories, modified BKKBN, mandate of the municipal, district or village head. The provincial government sees to the disbursement of the cards to the villages. The card can be used to obtain free health care services in all public health care facilities.

Other programs on the SSN programme include sale of subsidised rice (food security), community funds for public works (community empowerment), educational scholarships, etc.

The indicator measures the number of households that receive this insurance as a percentage of the total number of households.

c. Poor letters

Another way of protecting the poor from user fees is the *surat miskin*, also called poor letters or certificate. This waiver is obtained from the village head for a household. The village head in consultation with neighbourhood committees (Rukun Tetannga and Rukun Warga) decides on those who qualify as poor households. Holders of this *surat miskin* are entitled to partial or total fee waiver in government health care facilities.

The indicator measures the number of households that receive poor letters as a percentage of the total number of households.

d. Slum households

Going by the definition of UN-habitat as stated in Turkstra and Raithelhuber (2004), a slum is characterised by limited access to water and or sanitation, lacks secure tenure, is overcrowded or densely populated and has structures made from non-durable building materials. In Indonesia, slums are seen as households with little or no access to affordable health care, education or economic opportunities and which make do with makeshift shelters illegally located. These makeshifts are usually called *kampungs*.

Figure 5-2 Neighbourhood in DIY

Yossi and Sajor (2006) indicate that slums concentrate mostly along river channels and are therefore found in only villages having rivers running through them. This would therefore be a biased measure of socioeconomic position as not all villages in the province have rivers running through them. The relationship between this indicator and all other indicators are mostly negative which is also strange especially in areas where other indicators are worse off. This indicator is therefore discarded from any further analysis.

e. Temporary Buildings

Households are characterised by the nature of the buildings in which they live in. It is either temporary or permanent. Permanent buildings comprise houses in which the walls are made out of bricks or bricks and wood; the roof is made from aluminium sheets or wooden slates and the floor; floor or ceramic tiles. On the other hand, temporary houses range from brick houses dominated by wood or bamboo to those made from simple materials such as leaves and soil.

Figure 5-3 Temporary structure

This indicator measures the percentage of temporary buildings to the total number of buildings (both temporary and permanent).

f. Non-family planning users

Family planning is a means by which the government hopes to keep the population within acceptable limits. Since the program gained prominence in the 1990s, there has been a general pattern of decline in growth rates. This growth rate has fallen from 2.3% to 1.5% from the pre-family planning stage to the post family planning stage. Population growth in Yogyakarta is not declining but the rate of growth is relatively low from 1.1% through 0.57% and finally 0.72%. These rates apply to the year ranges 1971-1980, 1980-1990 and 1990-2000.

This indicator measures the number of non-family planning acceptors as a percentage of all married and adult population. It is however discarded from further analysis based on earlier mentioned studies in Yogyakarta (see section 5.3.1). It is not seen as an indicator that is relevant for determining the socioeconomic position of the villages. This is because both prosperous and poor do not feel obliged to restrict family sizes.

g. Non- luxurious buildings

Luxurious buildings are invested into by the government as a means to provide affordable, luxurious structures to the people. It is also to boost the real estate sector as taxes on such properties are

favourable. This initiative encourages the erection of quality homes. This indicator measures the number of non-luxurious buildings as a percentage of all buildings.

h. Non- ownership of phones

This indicator measures the number of households not connected to landlines as a percentage of all households.

i. Non- ownership of televisions

This indicator measures the number of households without television sets as a percentage of all households.

j. Non- ownership of satellite dishes

This indicator measures the number of households without satellite dish as a percentage of all households.

k. Non- ownership of 2-3 wheel drives

There are many kinds of non-motorised transports. The common ones are becak, bicycle and andong. These are mostly 2 or 3 wheeled. This indicator measures the number of households without 2-3 wheel drives as a percentage of all households. This includes commercial 2-3 wheel drives owned by a household.

l. Non- ownership of 4 wheel drives

This indicator measures the number of households without 4 wheel drives as a percentage of all households. This also includes commercial vehicles owned by a household.

m. Non- ownership of radio communications

This indicator measures the number of households without radio communication as a percentage of all households. This type of radio communication functions in a similar way like landlines but is wireless.

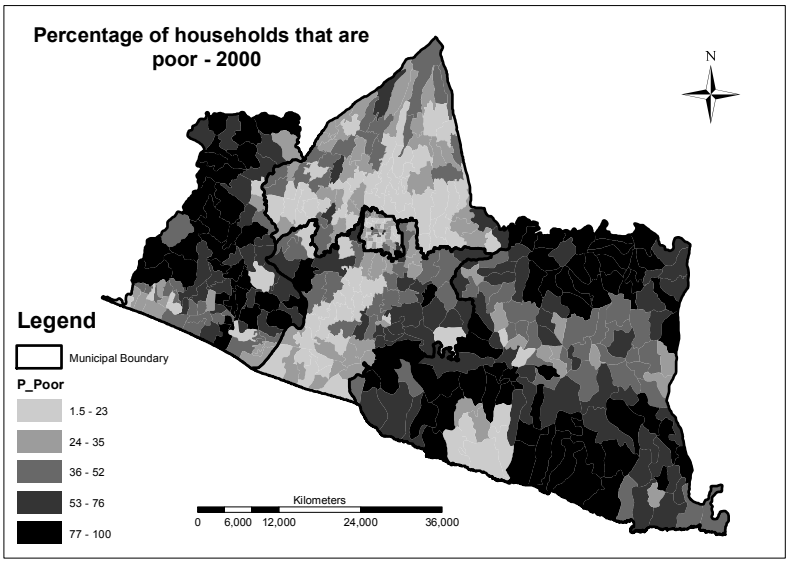
n. Non- highly educated households

This measures the number of households in which members have never been educated in the university as a percentage of all households.

All these indicators are studied further and a number selected for the development of the indices of socioeconomic position leaving the percentages of slum dwelling families and non-family planning acceptors. The next section elaborates on the distribution of the indicators across the province with a selected number of the indicators.

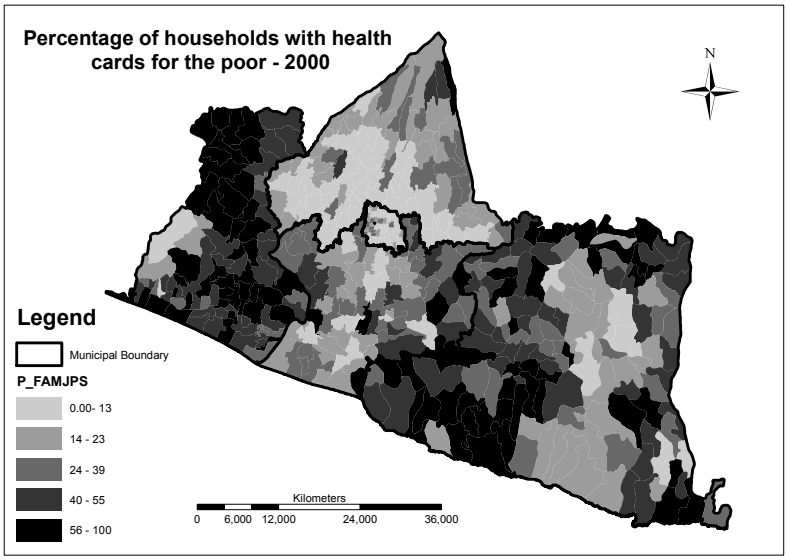
5.4. Identifying variations in socioeconomic position indicator values

This section explores a randomly selected number of the socioeconomic indicators to give an overview of the variations in socioeconomic indicators. The socioeconomic indicators are visualised below. The maps give an indication of the relationship between indicators from the spatial pattern of the indicators.



Map 5-1 Percentage of poor households
Source: Author's calculation from BPS dataset 2000

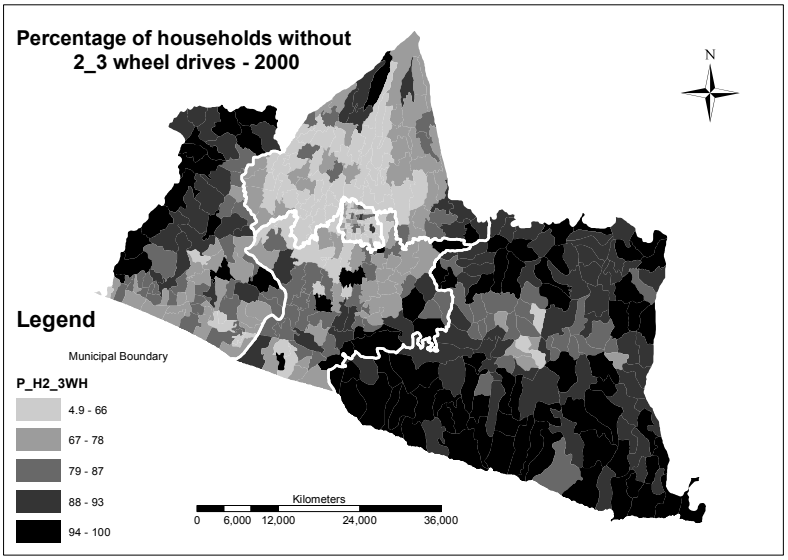
The map 5-1shows the distribution of households that are poor. The city of Yogyakarta in the central part as well as the northern and southern municipalities have fewer villages with households that are poor. Kulonprogo in the west and Gunungkidul in the east also have some villages with barely 1.5% of the households being poor. However, these two municipalities have the highest number of villages that fall within the worst fifth of poor households. Of the two municipalities, Gunungkidul has more poor households and about 57% of its households are said to be poor by the government (Gunungkidul Municipality Report 2005).



Map 5-2 Percentage of households with health insurance for the poor
Source: Author's calculation from BPS dataset 2000

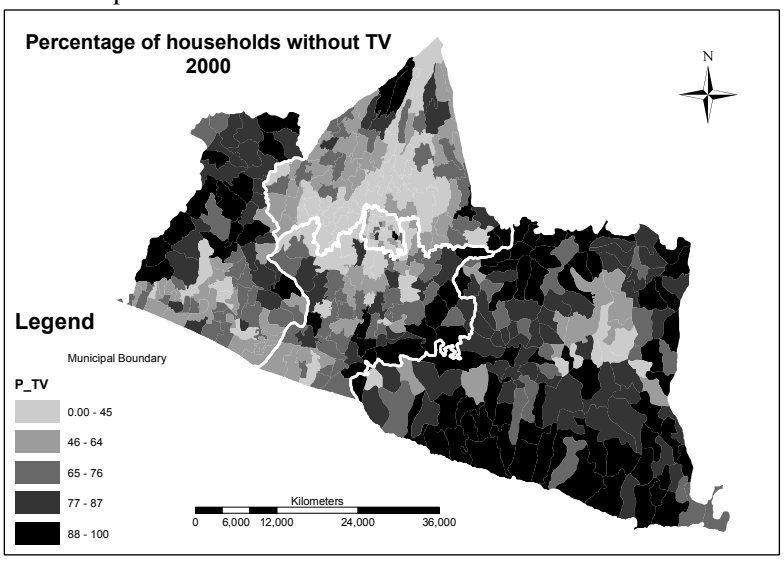
This indicator as seen from map 5-2 is relatively good across the entire province as compared to the percentage of poor households. This is because fewer households in the eastern municipality have

entire households having health insurance for the poor. The western municipality has quite a high number of households that have health insurance for the poor. The municipalities along the north-south portion have some villages with very little or no households having health insurance and this is indicated by the 0% - 13% range. These same municipalities also have few villages with very high percentage of households having health insurance for the poor (56% - 100%).



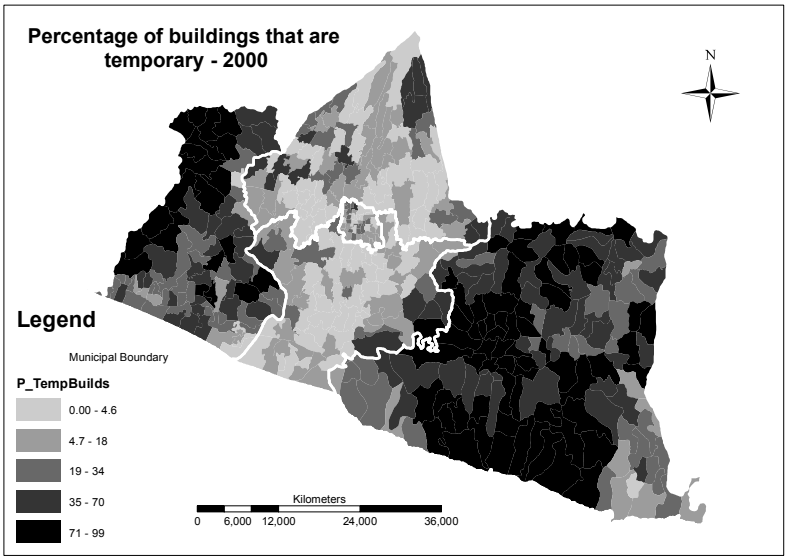
Map 5-3 Percentage of households without 2-3 wheel drives
Source: Author's calculation from BPS dataset 2000

As a key transportation mode, ownership of 2-3 wheel drives is very important and is evidenced by the low numbers of households without it (map 5-3). The three municipalities of Sleman (north), Bantul (south) and the city of Yogyakarta (central) are again better off as compared to the other municipalities. The western boundary of the municipality of Kulonprogo in the west as well as some villages in the eastern municipality of Gunungkidul have quite a high number of households without ownership of 2-3 wheel drives.



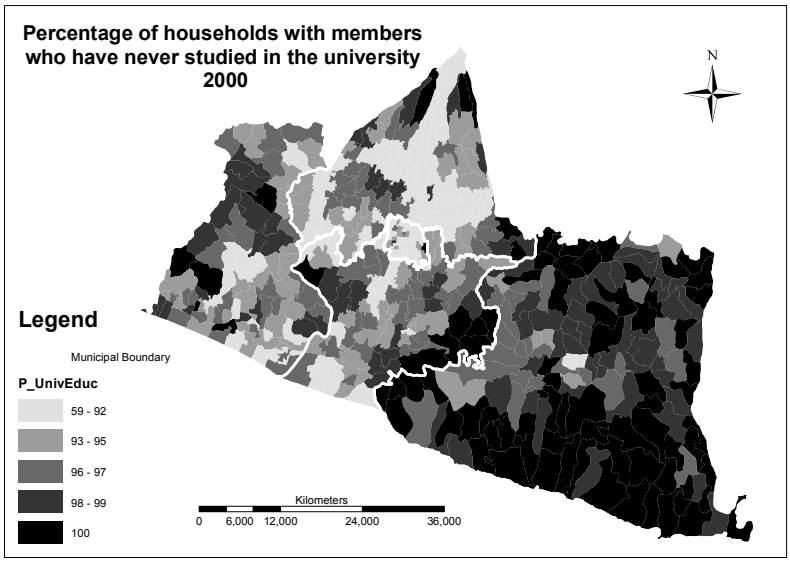
Map 5-4 Percentage of households without TV
Source: Author's calculation from BPS dataset 2000

The number of households without TVs is less in the central and northern municipalities as shown in map 5-4. The other municipalities also show some villages having a very small number of households without television sets.



Map 5-5 Percentage of temporary buildings
Source: Author's calculation from BPS dataset 2000

Temporary houses are the major type of housing infrastructure that villages in the western and eastern municipalities have (figure 5-5). These municipalities have fewer villages with less than 20% of housing being temporary. The municipalities of Kulonprogo and Gunungkidul are also estimated to have a housing deficit of about 23,000 (25%) and 27,000 (23%) respectively (Gunung Kidul Municipality Report 2005; Kulon Progo Municipality Report 2005; Special Province of Yogyakarta 2005). Though the north-south municipalities have less temporary structures, the housing deficit for the city of Yogyakarta alone is estimated at about 94,000 (92%) (Yogyakarta Municipality 2005).



Map 5-6 Percentage of non-highly educated households
Source: Author's calculation from BPS dataset 2000

Map 5-6 indicates that the eastern municipality of Gunungkidul has the highest number of households without highly educated members. The Gunungkidul municipality estimates about 58% of the inhabitants as not having any educational background (Gunung Kidul Municipality Report 2005).

This is to say that household members having both basic education as well as higher education are on the low side in this municipality.

All the other indicators of SEP show variations which are not so different from those shown above. To further understand the indicators and establish some relationship, the indicators are used in further analysis. The results (see appendix 6) highlights some correlations among the indicators of socioeconomic position.

The results give an indication of the relationship between selected samples of the socioeconomic indicators. Villages having a higher proportion of temporary buildings also have a higher proportion of poor households (0.566). Likewise, villages having a lower proportion of temporary buildings are also characterised by a lower proportion of poor households. The percentage of poor households also accounts for about 32% of the proportion of temporary buildings.

Also, the proportion of households without television accounted for about 26% of the proportion of temporary buildings. Villages with a higher proportion of households without television sets also have higher levels of temporary buildings and vice versa (0.508).

Not so different from the trend of relationship above is the relationship between households with no television sets and those with poor letters. Villages with higher proportions of households without television sets are also characterised by households with higher proportion of poor letters. The relationship between households with poor letters and households without television is however weak and statistically insignificant.

The analysis further shows that villages with higher proportions of households without 4 wheel drives, 2-3 wheel drives, radio communication, satellite dish and higher proportions of households with poor health insurance are all positively correlated. This implies the presence of multiple lack of resources needed to improve the socioeconomic position of the villages.

Contrastingly, villages with higher proportions of households having health insurance for the poor are negatively correlated with villages having higher proportions of households that are poor (-0.127). This is the say that villages with higher proportions of households that have health insurance for the poor are characterised by lower proportions of households that are poor.

Giving the trend of positive relationships that exist among almost all indicators, villages of lower socioeconomic position may be identified through a composite index. This is because such areas lack multiple resources at the same time and can genuinely pass for villages of lower socioeconomic position. The next section elaborates on the formation of indices that measure socioeconomic position so as to determine the relative positions of the villages in the province for policy measures.

5.5. Development of socioeconomic position indices

This section elaborates on the process in which the socioeconomic position indices are generated as a means of assessing the relative positions of the villages. Since multiple indicators are used in the analysis, a conclusive approach is needed to identify the socioeconomic position of the areas based on all indicators. This conclusive approach leads to the development of the indices which show the relative position of the villages based on all indicators. Principal component analysis is useful in this

regard. Four components are arrived at from PCA of which two are used to construct the indices[4] (see appendices 4& 5).

From the PCA, the extracted components explain about 64% of the variance in the observed variables. This is to say that the net effect of each indicator variable on the total variance of all indicators when maximised is about 64%. The four components are arrived at based on the eigen value criterion greater than one criterion. However, in concluding on which components to accept, Hatcher (1994), Vyas and Kumaranayake (2006) recommend the following other criteria must be met:

- Confirmatory scree test which identifies the most obvious break in the data and categorises data above the break as significant and that below as insignificant. For this study, the most obvious break was read from the scree plot after the four components. All four components therefore qualify under this criterion (appendix 3).
- Proportion of variance accounted for in the data set. This is based on a threshold above and below which indicators are either retained or discarded. This measure is arbitrary and varies from author to author. The author retains all components under this criterion as well.
- The final test is the interpretability test which requires among others;
    - That there are at least three variables with significant loadings on each retained component.
    - That variables that load on a component share a conceptual meaning
    - That variables are distinctly measuring different constructs that they load heavily on

However, considering the criterion above, components three and four are discarded from any further analysis because only one variable has significant loadings on three and four apart. This is to say that for a component to be significant, weights must be on at least 3 or more variables. Also the internal consistency of components is checked prior to constructing the indices so as to see whether the indicators for any index are relevant. The consistency can only be done when there are two or more weighted variables and this is not possible for the third and fourth components of the PCA.

After considering all criteria, the final indices that reflect the socioeconomic position of the villages are:

Welfare index

This index comprises some indicators that are highly weighted as compared to others. Such indicators include:

- Percentage of houses that are temporary
- Percentage of households that are Pre & Prosperous I
- Percentage of households without 2_3wheel drives
- Percentage of households without Television sets (TV)
- Percentage of households without health insurance

Although the index comprises some assets, the dominant number of indicators is more of welfare-like indicators. The index is therefore named *Welfare index* to reflect the weightier indicators.

[4] An index as used in this study is read in such a way that a higher value corresponds to low socioeconomic position and a lower value corresponds to high socioeconomic position. For the standardised values which range between 0 and 1, values closer to one are of a lower socioeconomic position.

Asset index
This index places heavier weights on the following:
- Percentage of households without 4 wheel drives
- Percentage of households without satellite dish
- Percentage of households without radio communication
- Percentage of households without phones
- Percentage of households whose children have not studied in the university.

This index also contains mostly asset based indicators and is therefore named *Assets index* to reflect the indicators that have heavier weights.

The general formula for computing the indices is illustrated below. However the computation for the *Welfare* and *Asset* indices is shown in appendix 3.

$C_1 = b_{11}(X_1) + b_{12}(X_2) + \ldots b_{1p}(X_p)$
Where,
C_1 = the subject's score on principal component 1 (the first component extracted)
b_{1p} = the regression coefficient (or weight) for observed variable p, as used in creating principal component 1
X_p = the subject's score on observed variable p.

From the dataset, it suffices then to say that the best way to describe the socioeconomic position of people in the villages in D. I. Yogyakarta is to consider their welfare characteristics. This specifically encompasses percentage of temporary buildings, percentage considered poor, percentage on health care insurance for the poor, and percentage without 2 or 3-wheel drives and television sets**.** Other indicators may be used which are secondary to the above and include mostly assets such as percentage without radio communication, household phones, satellite dish, 4-wheel drives and percentage of households with members who have not studied in the university. The next section shows the description and distribution of the indices.

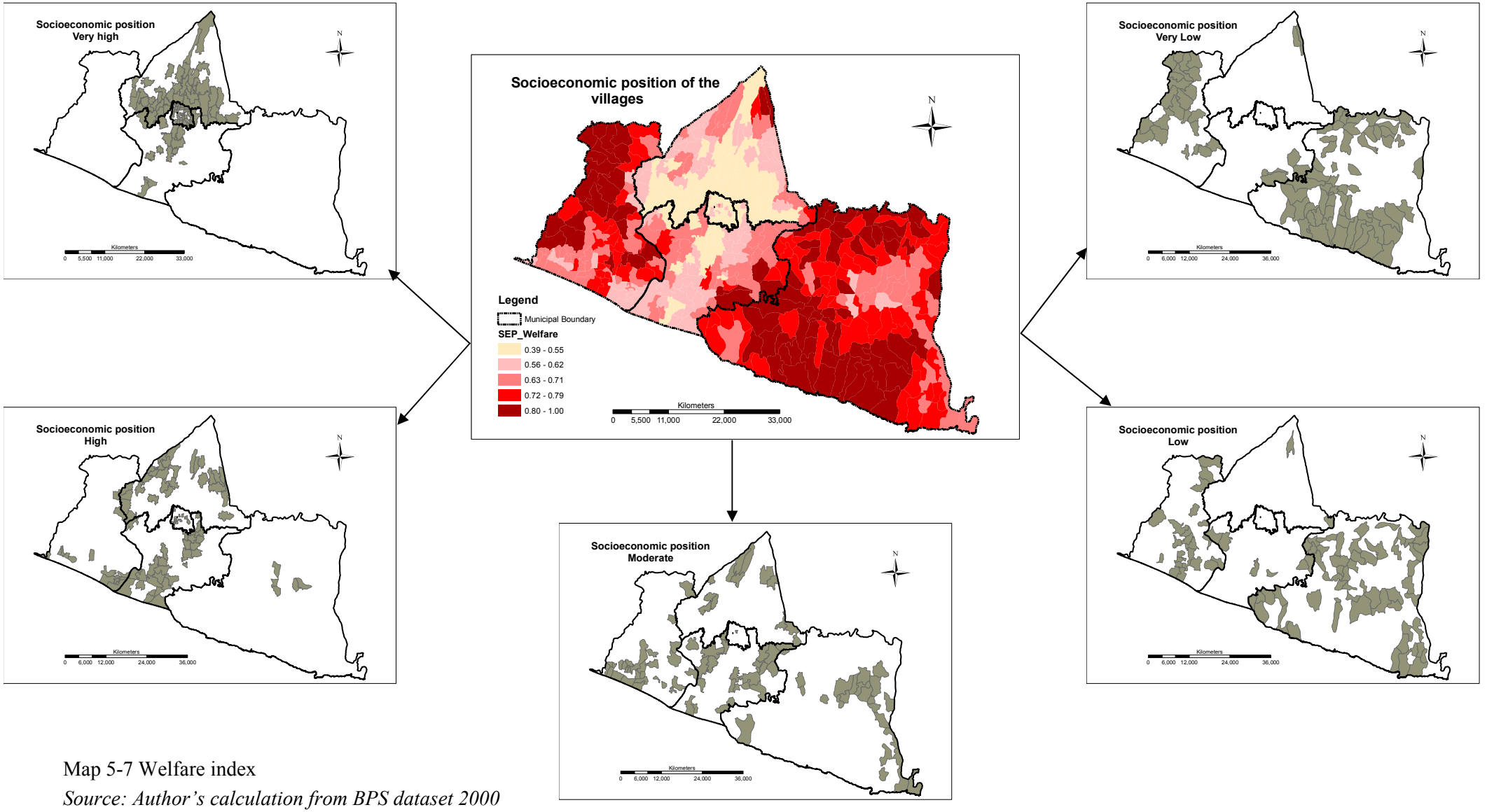
5.5.1. Description of socioeconomic position Indices

This section describes the indices into detail. It is visualised in five quintiles so as to see the villages that fall within each quintile and their spatial extent. The component parts of the indices are illustrated for clarity.

Welfare Index
The Welfare index (map 5-7) shows a concentration of areas of high socioeconomic position in the city of Yogyakarta as well as the southern parts of Sleman municipality and northern parts of the municipality of Bantul. The fifth worst villages which are also those of the lowest socioeconomic position are found mostly in the municipalities of Gunungkidul and Kulonprogo. The western part of Kulonprogo which is hilly and landslide prone is not conducive for farming which is the main activity of the people and this affects production of crops and the economic situation of the people. The people therefore rely greatly on government support in the form of health insurance. They are also characterised as poor and have less television sets and 2-3 wheel drives. These areas also have a high amount of temporary buildings.

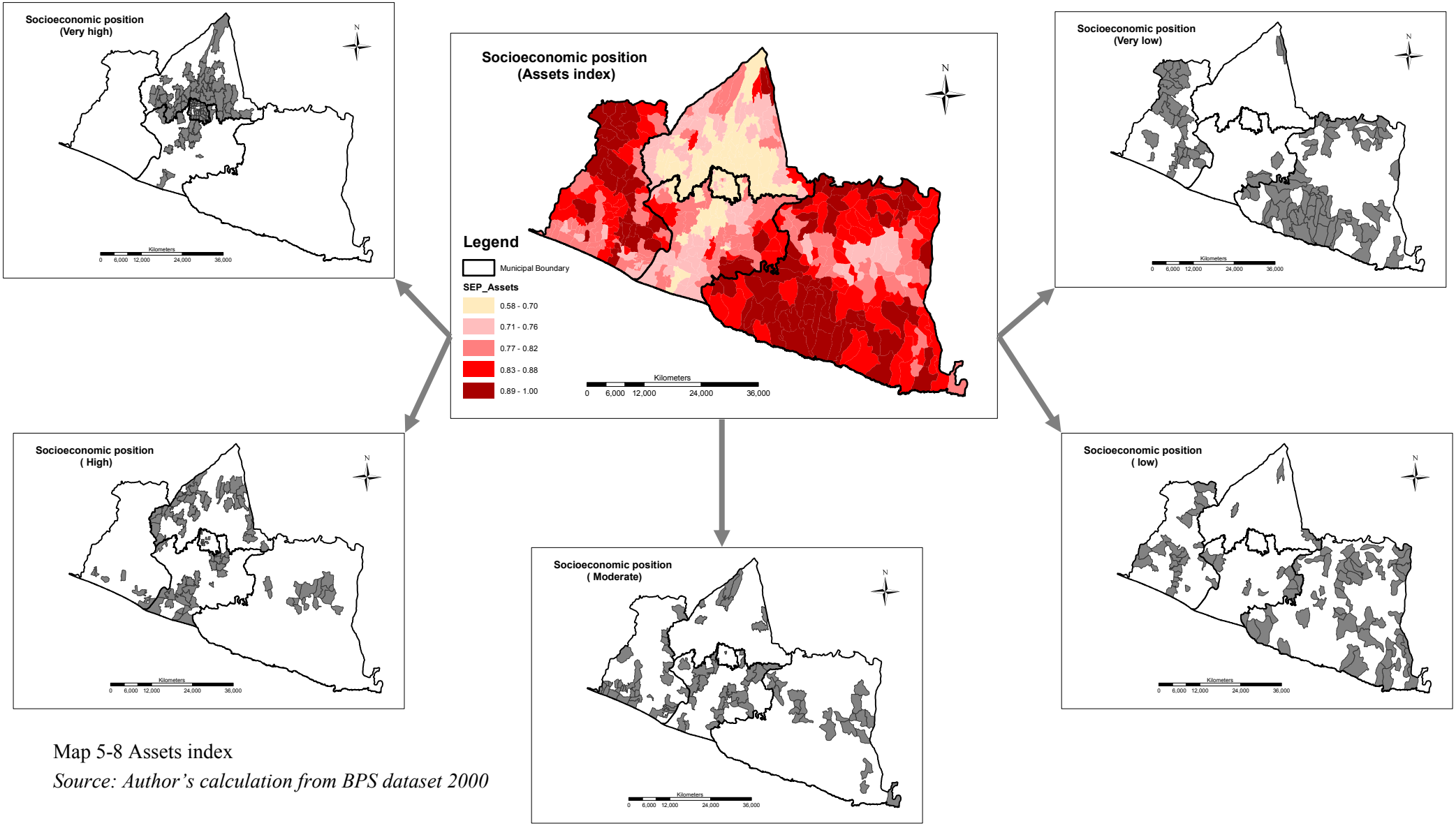
Asset Index

From the map 5-8, the municipalities with the highest number of villages that fall within the worst fifth are the Kulonprogo (west) and Gunungkidul (east) municipalities. These municipalities have less of household phones, radio communication, 4-wheel drives, satellite dishes and fewer numbers of households with members who have studied in the university. The city of Yogyakarta on the other hand has the best socioeconomic position. This is because the city is the hub of most economic activities with little agriculture (Yogyakarta Municipality 2005); there is a higher rate of employment as well as opportunities for more income to buy these assets. This really influences the socioeconomic situation of the villages in the city.



Map 5-7 Welfare index

Source: Author's calculation from BPS dataset 2000



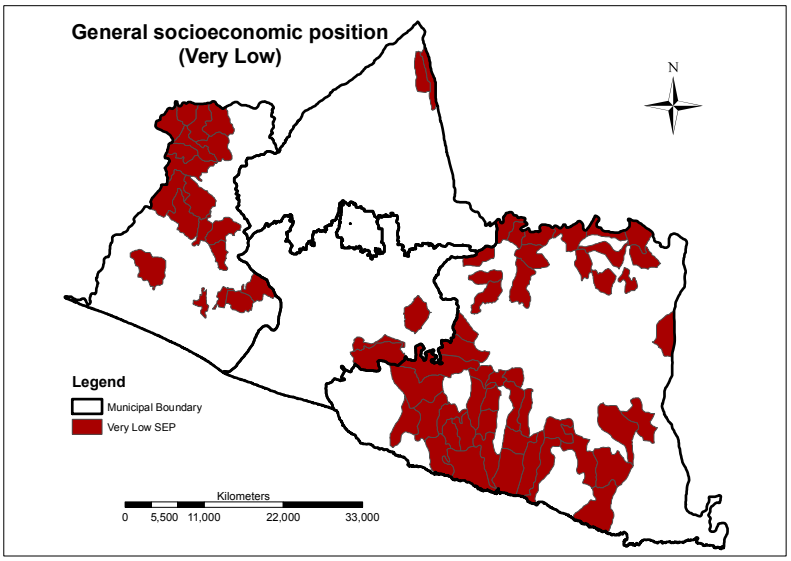
Map 5-8 Assets index

Source: Author's calculation from BPS dataset 2000

a. Identifying priority areas from non-priority areas

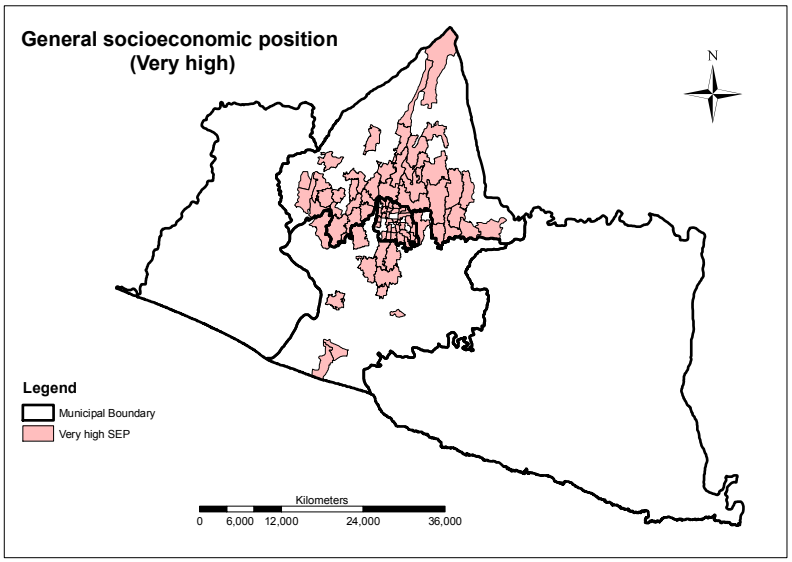
This section elaborates on the location of the very high and very low socioeconomic positions. This is for the purposes of identifying priority areas from non-priority areas for policy interventions.

Since *Welfare* and *Assets* are useful for identifying the socioeconomic position of the villages, the study highlights where the very high socioeconomic areas occur as well as where the very low socioeconomic position areas occur. The figure below summarises the villages that fall within the very low SEP for both *Assets* and *Welfare*. From map 5-9, the very low SEP villages are located in the western and eastern municipalities. These villages lack both in terms of welfare and assets.



Map 5-9 Location of very low SEP (Asset and Welfare combined)
Source: Author's calculation from BPS dataset 2000

The location of the villages of very high SEP is illustrated in map 5-10. These areas may not be priority areas for policy intervention as they are better off in terms of welfare and ownership of asset.



Map 5-10 Location of very high SEP (Asset and Welfare combined)
Source: Author's calculation from BPS dataset 2000

5.5.2. Usefulness of constructed indices

The socioeconomic indices are useful for the following reasons:

- The constructed indices are quite exhaustive and may be used to describe socioeconomic position considering the purpose of any study.
- The components of the SEP indices may be used to assess socioeconomic position of areas in an aggregated level.
- The indices can be used to compare villages such that the lower the score, the better off the position of the village and the reverse is true. This comparison can also be done between municipalities to identify those villages that fall within the worst fifth or 10%.
- The indices may be used to group areas by using thresholds such as 20%, 40%, 60%, 80% or 100%. This can help identify priority areas or hotspots. The choice of grouping can however be informed also by policy or the purpose of any study.

5.5.3. Limitations of the constructed indices

Although the indices have extensive uses, this section explains some inherent limitations.

- The indices are relative measures and cannot be used to determine in absolute terms how much a village is better off as compared to another village. This is to say a village ranked 2 cannot be said to be twice better off than another ranked four. The ranks cannot be interpreted as absolute measures.
- Scores in indices cannot be compared directly as they are weighted and have different maximum and minimum values. However for any such comparison, the ranks can be used.
- The indicators represent various aspects of deprivation and donot necessarily connote that a lack of deprivation is tantamount to affluence. It only shows that deprivation is less.
- The indicators are aggregated and therefore conceal any form of heterogeneity within the villages. A very deprived village may not necessarily have all the inhabitants deprived and a less deprived village may not necessarily have all the inhabitants being less deprived.
- The indices are not comparable with other indices of other countries and are therefore useful in this context alone.

5.5.4. Socioeconomic position of the municipalities

The study further looks into how the municipalities fare on the Welfare index (see appendix 10). The entire province is divided into five groups; the first quintile refers to the very high socioeconomic position, the second means high socioeconomic position, the third is moderate, the fourth is low and the fifth quintile which is also the worst is the very low socioeconomic position. The five groups are divided in such a way that each group has an equal number of cases (i.e. villages).

The dataset shows that there are no villages in the municipalities of Gunungkidul and Kulonprogo which are of a very high socioeconomic position. About 47% of the villages in the very high socioeconomic position are found in the municipality of Sleman. The city of Yogyakarta falls in about 37% of the villages of very high socioeconomic position as compared to 16% for the municipality of Bantul. However, the municipalities of Gunungkidul and Kulonprogo make about 6% and 16% respectively of the villages in the second quintile; high socioeconomic position.

Looking at the scenario below the moderate socioeconomic position, there is no village in the city of Yogyakarta that falls within the lower socioeconomic positions. Sleman municipality which has the highest number of villages of the very high socioeconomic position has also the lowest proportion of villages in the lower socioeconomic positions. The proportion of villages in Bantul within the lower socioeconomic positions is also less considering the situation in the higher socioeconomic positions. Over 64% and 66% of the villages in the municipality of Gunungkidul are within the low and very

low socioeconomic positions. Kulonprogo follows with about 26% of villages in both lower socioeconomic positions.

It suffices to say that although Sleman has the highest proportion of villages in the first quintile, the city of Yogyakarta in general has the highest socioeconomic position. The second highest socioeconomic position is that of Sleman. Bantul and Kulonprogo have the third and fourth highest socioeconomic positions. The municipality with the worst socioeconomic position is that of Gunungkidul.

5.5.5. Rural and urban distribution of socioeconomic position indices

The study also explores the distribution of urban and rural areas on the indices. This is initially done for the Welfare index.

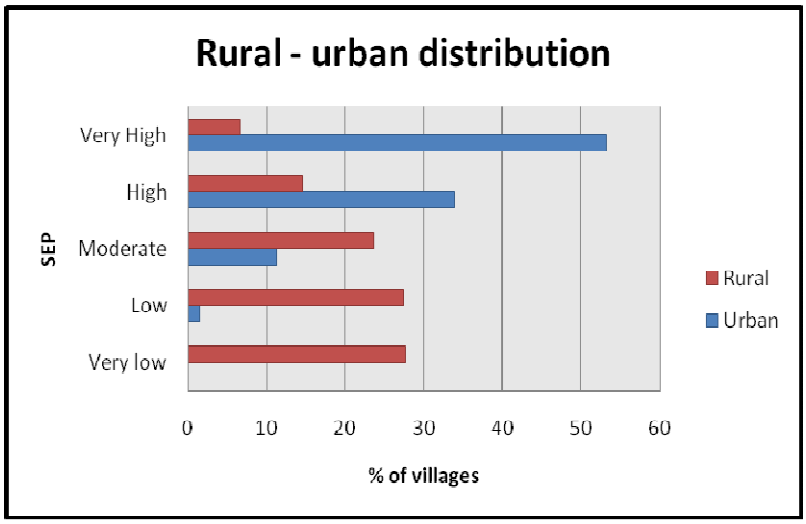


Figure 5-4 Rural versus urban distribution of SEP
Source: Author's calculation from BPS dataset 2000

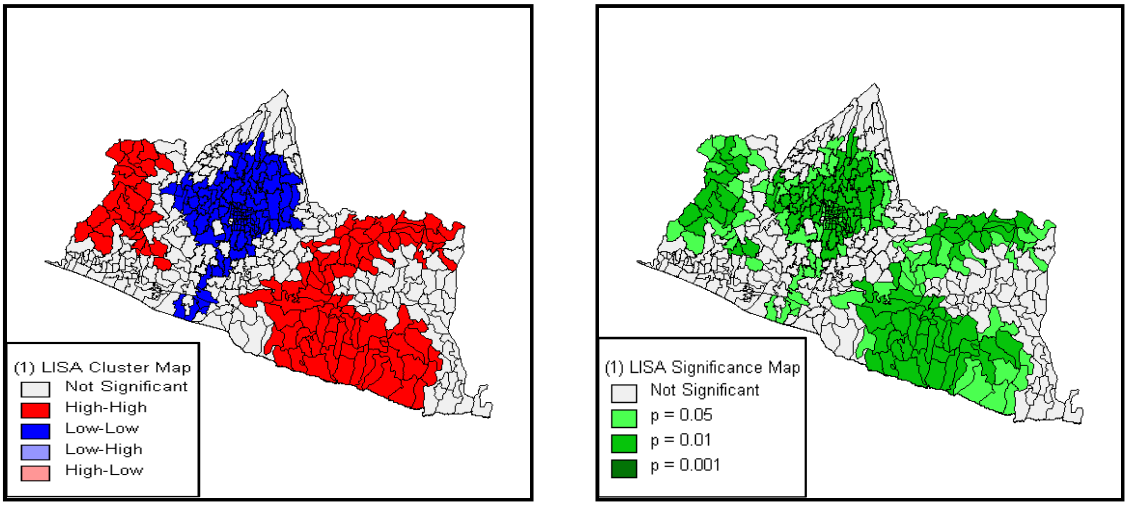
Out of the 438 villages in the Province of Yogyakarta, 314 of them are rural villages whereas the remainder are urban villages. The figure 5-4 shows there is no village in the urban area that is within the very low socioeconomic position. The results further indicate that about 53% of the urban villages are within the very high socioeconomic position as compared to 6.7% of the rural villages that fall within the very high socioeconomic position. There is also a high proportion of the rural villages (about 55%) that fall within the lower socioeconomic positions as compared to about two percent of the villages in the urban villages that fall within the low socioeconomic positions.

The Asset index also shows a similar association between the rural and urban areas of the province and is therefore not reported. The results indicate that there are more villages in the rural areas that have lower socioeconomic positions than the urban areas. The urban areas on the other hand, are mostly of higher socioeconomic positions.

5.6. Hotspots of socioeconomic position

This section assesses whether there is spatial clustering of villages of similar socioeconomic position and the ways in such villages cluster.

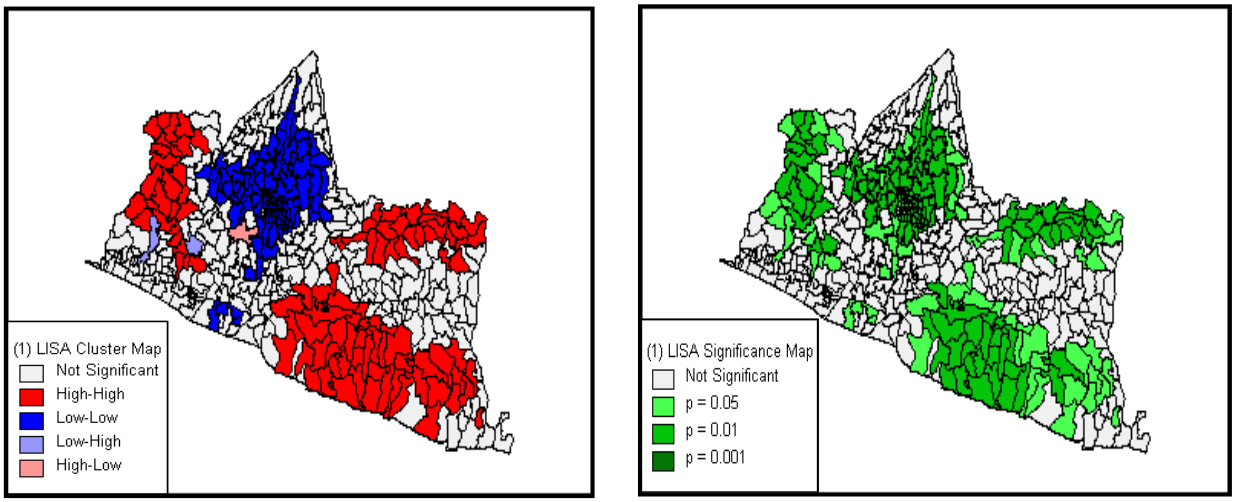
Spatial clustering is explored with the use of GeoDa for the purposes of identifying whether there is the existence of spatial clusters based on the *Welfare* and *Assets* indices. The map 5-11 summarises the nature of the spatial clusters of the *Welfar*e index. The map on the left is a LISA map whereas that on the right is a significance map. The LISA map shows where and how the socioeconomic positions cluster. The significance map on the other hand shows the degree of certainty of the clusters.



Map 5-11 Spatial clustering of *Welfare* index and associated significance
Source: Author's calculation from BPS dataset 2000

The Moran's I is given as 0.7834 which shows the spatial clustering of villages of similar socioeconomic position. From the map, higher SEP is shown by a clustering of low-low areas whereas high-high depicts a clustering of areas of lower socioeconomic positions. The areas of lower socioeconomic positions are in the western and eastern municipalities of Gunungkidul and Kulonprogo. Such areas of lower socioeconomic positions require priority in terms of policies such as discriminatory policies which would entitle them to a boost in the economic activities and in the long run, better their welfare. On the contrary, the city of Yogyakarta and the municipality of Sleman are concentrations of higher socioeconomic position. These areas are better off in terms of welfare-related issues.

The significance map shows the probability of the clustering occurring. When p = 0.05, comparing it with the LISA shows that there is a 95% chance of villages of low socioeconomic position clustering in the eastern and western parts.



Map 5-12 Spatial clustering of *Asset* index and associated significance
Source: Author's calculation from BPS dataset 2000

The Moran statistic is 0.7571for the *Asset* index also indicating a high possibility of spatial clustering. Map 5-12 indicates higher SEPs are along the north-south direction covering the entire city of Yogyakarta and some villages in the municipalities of Sleman and Bantul. The lower SEPs are mostly clustered in the western and eastern municipalities of Kulonprogo and Gunungkidul. These villages of low socioeconomic position are within the dry, landslide prone and hilly areas of the Kulonprogo municipality on the one hand and some parts of the mountain range of Gunungkidul.

The high-low and low-high villages show the clustering of low and high socioeconomic positions. High-low implies the clustering of villages of low socioeconomic position besides villages of high socioeconomic position. The reverse holds for low-high.

The spatial correlation analyses shows there is spatial clustering of areas of low socioeconomic position and an area specific policy may work to ameliorate the position of these villages. However, caution must be exercised as some villages which are not spatially correlated with neighbouring villages but also are of a much lower socioeconomic position than those villages may be left out. There is the need for further analysis to ascertain whether there are no areas that are worse off that may need spatially targeted policies. This is however outside the scope of this analysis.

a. Limitations in spatial analysis of socioeconomic position

The main problem encountered in most spatial analysis is that of ecological fallacy. It occurs when analyses based on group data vary from individual level analysis. This problem is heightened when individual or household data is aggregated and in this case to the village level and later the aggregated data is used to deduce individual behaviour or characteristics. This is to say that since data is at the village level, it might not entirely reflect the nature of all households in the villages because aggregated data averages out or smoothens out the heterogeneous nature of the village thus assuming homogeneity. Not everybody living in the village may be equally deprived; some may be worse off or better off than others. However, Gotway and Young (2002) have emphasised the need for spatial aggregation as necessary for creating meaningful units for analysis. They further assert that depending on the use of relevant methods and techniques, area based policies may work.

5.7. Summary and discussion on results of socioeconomic position assessment

This chapter explores the relationship between various socioeconomic indicators at the village level using some basic statistics such as correlations and frequencies to determine relevant indicators for further analysis. Fourteen indicators are reduced to 12 and these selected indicators are used to develop indices of socioeconomic position from Principal Component Analysis (PCA). From the PCA, it is realised that the ideal way to measure socioeconomic position is by considering the welfare and assets of the villages. The indices also show that urban villages and villages in the city of Yogyakarta are mostly of high socioeconomic position.

Spatial correlation analysis is done to determine if there is a clustering of hot and/or coldspots. Villages in the municipalities of Gunungkidul and Kulonprogo are found to be hotspots of low socioeconomic position. On the contrary, the villages in the city of Yogyakarta, Bantul and Sleman are seen to be of higher socioeconomic positions.

6. Relating provision of health care and education to socioeconomic position

6.1. Introduction

This chapter looks into the analysis of the relationship between two blocks; socioeconomic position and the provision of health care and education. By exploring indicators, underlying patterns are established between the indicators of health care and education provision as well as SEP. The relationship is taken to another level to explore the indices and the indicators after which the indices are studied to summarise the relationship between the two blocks. This relationship is also studied over time to see if there has been some improvements or otherwise. Provision of health care and education is further studied in relation to health and education statuses to see if the former are determined by the latter.

6.2. Methodological approach

With the use of SPSS and Excel, the relationship between the provision of public services and socioeconomic position of the villages is analysed. The approach is summarised below:

Table 6-1 Summary of approach

	Indicator	**Index**
Indicator	A	B
Index	C	D

The table above illustrates four main sections which are analysed below to establish the relationship systematically. At the initial stage, the analysis is done between indicator variables of public services provision and socioeconomic position which is the "A" part. This is followed by the analysis of the relationship between the indices and the indicators "B & C" parts. Finally the indices of public services provision and those of socioeconomic position are analysed; "D". The analyses of the component parts are summarised below:

Table 6-2 Components of analyses

Component	**Analysis**	**Tool**
A	Health care provision indicators and SEP indicators	SPSS
	Education provision indicator and SEP indicators	SPSS
B and C	Health care provision indicators and SEP welfare index	Excel
	Health care provision indicators and SEP asset index	Excel
	Education provision indicator and SEP welfare index	Excel
	Education provision indicator and SEP asset index	Excel
D	Health care provision index and SEP welfare index	Excel
	Health care provision index and SEP asset index	Excel

6.3. Relationship between public service provision and socioeconomic position indicators

This section highlights patterns seen in the relationship between the indicators of the two blocks. The relationship between health care indicators and SEP is elucidated first after which that of education and SEP is elaborated upon.

6.3.1. Establishing relationship between health care provision and socioeconomic position

The relationship between the indicators of SEP and health care provision is investigated using Pearson correlation coefficient. The table 6-3 summarises the relationship. The results show that the relationships between most of the variables are statistically insignificant. However, for those that are significant, there is an inverse relationship among most of them.

Table 6-3 Correlations of selected data

Category	Population HC	Population MC	Population MP	Distance MC	Distance HC	Distance MP
Temporary	-.159**	-.070	-.061	.015	.101*	.069
Poor	-.139**	.041	-.031	-.022	-.001	.049
Poor letters	.001	-.025	-.018	-.014	-.044	-.009
Luxury	.048	-.137**	.007	.021	-.064	.030
4 - Wheels	-.028	.091	-.124**	-.034	.019	.058
2-3 Wheels	-.137**	.063	-.047	-.054	.042	.040
Satellite	.005	-.032	-.034	.018	.018	.034
TV	-.113*	.019	-.041	-.024	.045	.092
Radio	-.021	.005	-.050	.047	.047	.125**
Phone	.030	.066	.026	-.002	.014	.122*
Insurance	-.183**	-.064	-.150**	-.032	-.005	.108*
Education	-.046	.083	-.106*	.027	.000	.078

HC – Health center, MC – Maternity clinic, MP – Medicine Post

Source: Author's calculation from BPS dataset 2000

The population per health center is negatively correlated with the proportion of temporary buildings (-0.159), the poor (-0.139), 2-3 wheels (-0.137) and insurance (-0.183). This implies that villages with high population per health center are characterised by low proportion of temporary buildings. It also shows that such villages are likely to have fewer proportions of poor people, non-ownership of 2-3wheels and number of people on health insurance for the poor. Consequently, villages with low population per health center are likely to have higher proportions of the poor, temporary buildings and like. The trend of the relationship is not any different for that of the population per maternity clinic and the SEP indicators as the population increases in villages with a fewer proportion of luxurious buildings. It also reduces in villages with a higher proportion of luxurious buildings. Villages with higher population per medicine post are also characterised by fewer households whose members have not studied in the university as well as fewer persons on health insurance for the poor and non-ownership of four wheel drives.

In terms of distance, there is no significant relationship between the distance to maternity clinics and any socioeconomic indicator. However, villages with longer distances to a health center have a higher

proportion of temporary buildings and vice versa. Also there is a higher proportion of households with radio communications, health insurance for the poor and phones in those villages with longer distances to medicine posts.

This section has shown that villages with higher population per the various health facilities tend to be socioeconomically better off whereas those villages with higher distances to the various health facilities tend to be worse off socioeconomically. However, what is meant by a better off village is explained after looking into education.

6.3.2. Establishing relationship between education provision and socioeconomic position

The relationship between the indicators of education provision and SEP also show an inverse one with very few of them statistically insignificant. Higher proportions of the poor are found in villages with lower numbers of people sharing a primary facility. Villages with fewer people per primary school as used here are characterised by higher proportions of households that have health insurance for the poor, temporary structures, non-ownership of 4-wheels, 2-3 wheels, TV, etc (see appendix 7).

The trend of the relationship is not so different from that which is observed earlier. Socioeconomically better off villages have more people sharing a primary school compared to the less better off. The next section looks into the villages that are socioeconomically better off and the relationship with the health indicators.

6.4. Relationship between health care and education provision indicators and socioeconomic position indices

In furtherance to the section above, identifying the better off villages and assessing the level of public services due them is done next. The study area is divided into five socioeconomic positions known as the SEP quintiles. These quintiles are based on the 2 socioeconomic indices; *Welfare* and *Asset*. These quintiles have almost the same number of villages in each. The relationship between health care provision indicators and the quintiles are elaborated upon first.

6.4.1. Socioeconomic position quintiles and indicators of distances to various health facilities

This section establishes the relationship between the indicators of health care and the *Welfare* and *Asset indices*. However, the results are similar therefore only that of the Welfare index is reported. The graph below summarises the relationship.

One of the key areas in the provision of health care is the distance with regards to the villages. Although standard distances vary from country to country, each country has its own acceptable minimum. The distances to the various health facilities are studied next against the SEP quintiles.

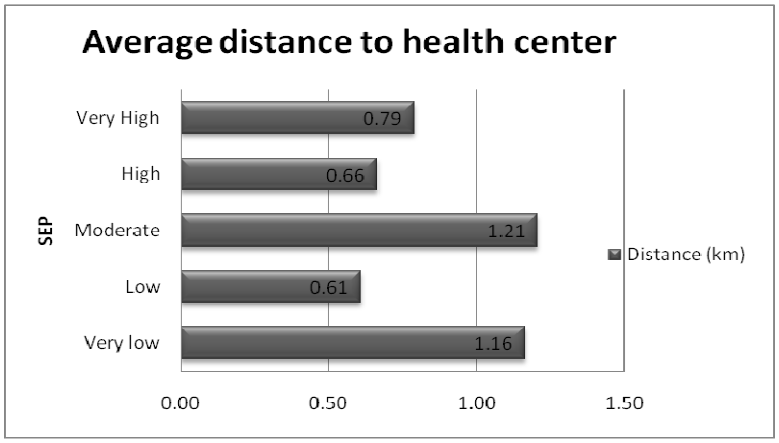


Figure 6-1 SEP and distance to health center
Source: Author's calculation from BPS dataset 2000

The average distance to a health center is less than 1.50km. Within the range, the low socioeconomic position group of villages are just a little over half a kilometre. The villages within the moderate group are farthest away from health centers. The very low socioeconomic group are the second farthest from the health centers.

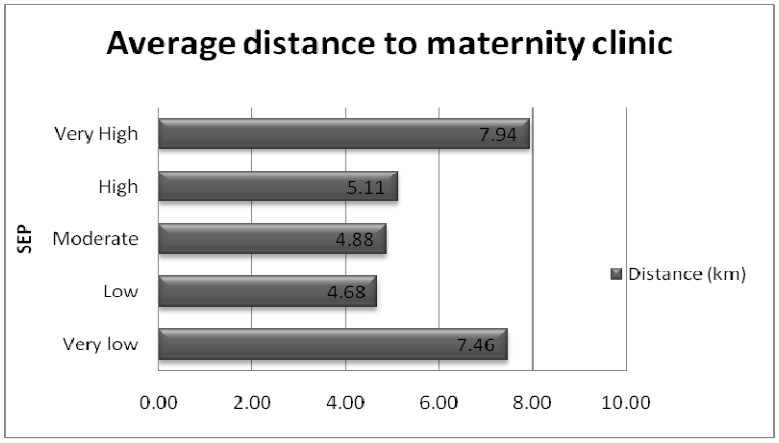


Figure 6-2 SEP and distance to maternity clinic
Source: Author's calculation from BPS dataset 2000

Maternity clinics on the one hand are farther as compared to the distance to health centers. Villages within the very high socioeconomic group are more distant from maternity clinics than the very low socioeconomic group. The low socioeconomic group is within the shortest distance of about 4.7km.

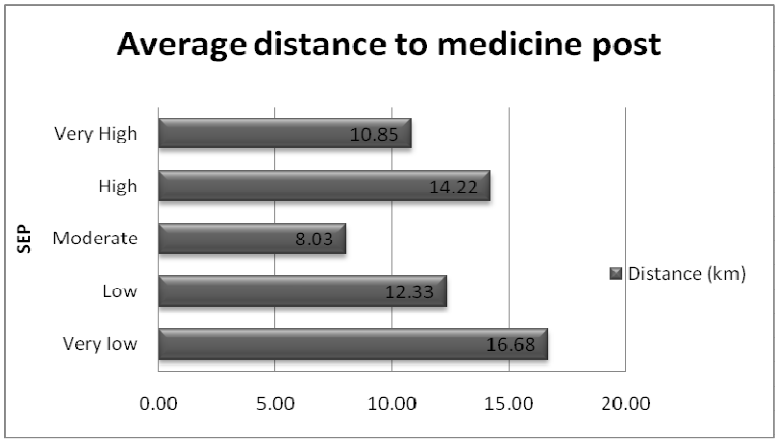


Figure 6-3 SEP and distance to medicine post
Source: Author's calculation from BPS dataset 2000

The very low socioeconomic group are farthest from medicine posts (>16km). The moderate socioeconomic group are within 8km of the medicine posts. The very high socioeconomic group have a shorter distance though over 10km.

The relationship between SEP and the population per the various health facilities are investigated next.

6.4.2. Socioeconomic position quintiles and population per various health facilities

This section highlights the relationship between the indicators of health care and the *Welfare* and *Asset Indices*. For this investigation, only the results of the welfare index are reported because results are similar for both indices. The graph below summarises the relationship.

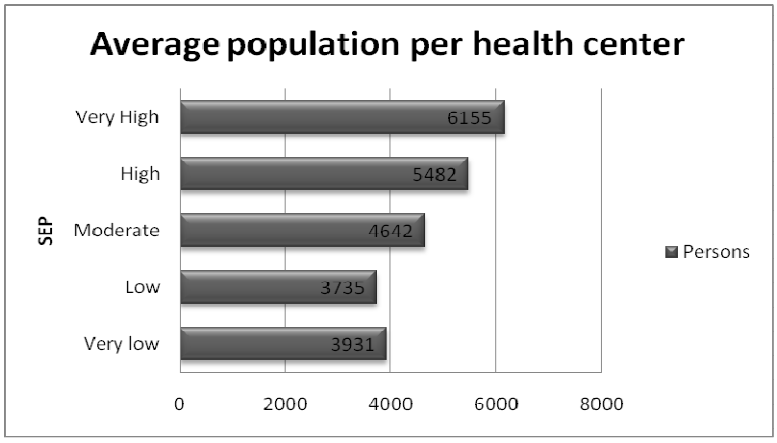


Figure 6-4 SEP and population per health center
Source: Author's calculation from BPS dataset 2000

The availability of a health center is determined to a large extent by the population sharing that health center. From figure 6-4, population sharing a health center tends to increase towards the higher socioeconomic positions. The health center with the minimum amount of people sharing it is found in the low SEP. On the other hand, the very high SEP have a very high number of persons sharing a

health center. All the quintiles exceed the stipulated national average of 3000 persons per health center. This is an indication of less availability of health centers.

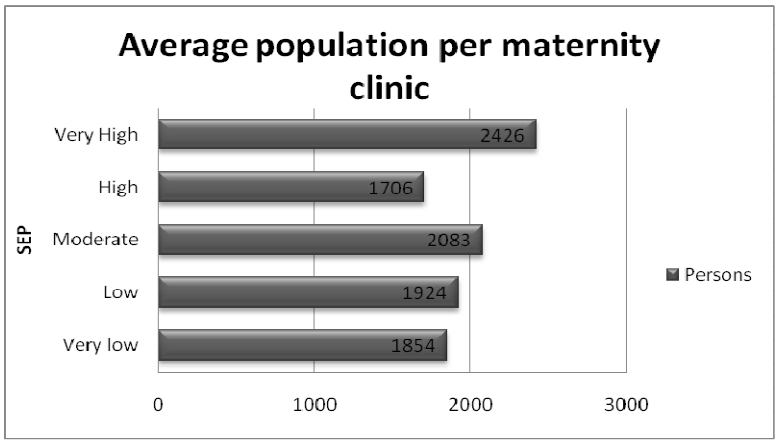


Figure 6-5 SEP and population per maternity clinic
Source: Author's calculation from BPS dataset 2000

The pattern of the relationship is not so different for the SEP quintiles and the population sharing a maternity clinic (figure 6-5). The very high SEP have the highest number of persons sharing a facility. The very low SEP on the other hand have the second lowest number of persons sharing a facility. The numbers are quite low as compared to the number sharing a health center.

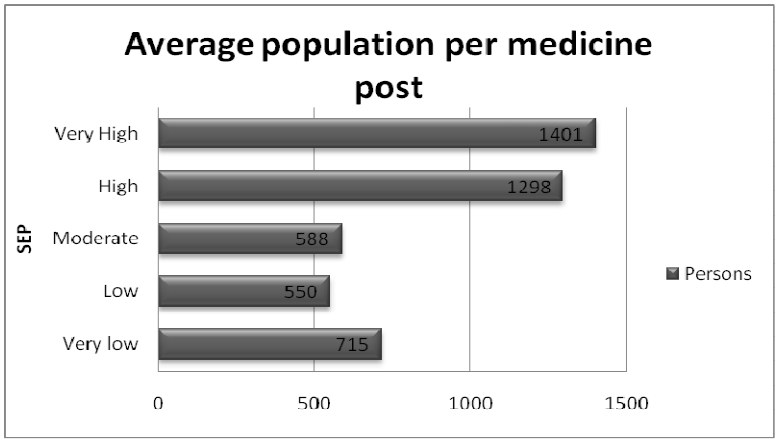


Figure 6-6 SEP and population per medicine post
Source: Author's calculation from BPS dataset 2000

From the figure 6-6, the availability of medicine posts point towards the very high SEP group as having more people sharing a post. The low and very low SEP have relatively fewer numbers of persons sharing a medicine post. For this indicator, the numbers are less but there is no national standard to be used as yardstick to the best of the author's knowledge.

This section shows rather high numbers of persons sharing health centers as compared to maternity clinics and medicine post. The very high SEP have the highest number of persons sharing the various health facilities.

6.4.3. Socioeconomic position and primary school provision indicator

This section looks into the relationship between the SEP quintiles and population per primary school. The results show that the higher SEPs have more people sharing primary facilities as compared to the lower SEPs. The low SEP quintile has the least number of persons sharing a primary facility.

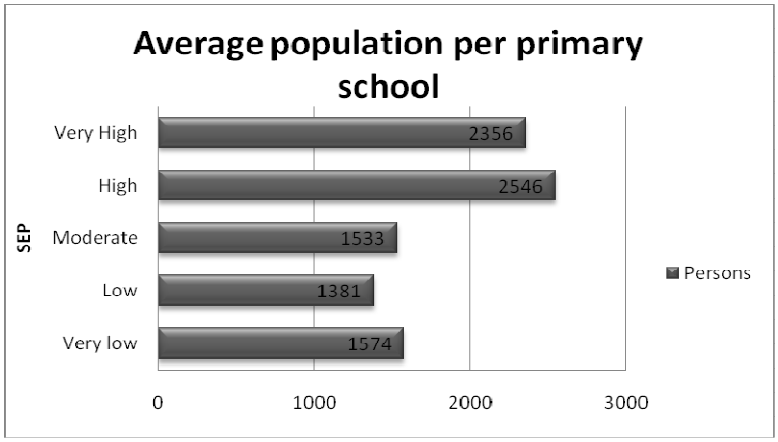


Figure 6-7 SEP and population per primary school
Source: Author's calculation from BPS dataset 2000

6.5. Relationship between health care indices and socioeconomic indices

This section elaborates on the relationship between the health care indices (i.e. population per health facility and distance to health facility) and SEP. The quintiles are used here also to show the level of health care pertaining to the various SEPs so as to know the areas that need priority in terms of interventions.

6.5.1. Socioeconomic quintiles and population per health facility

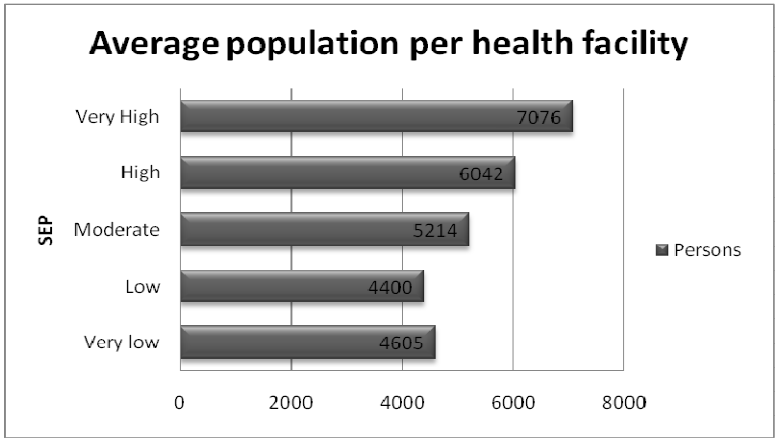


Figure 6-8 SEP and population per health facility
Source: Author's calculation from BPS dataset 2000

To understand the relationship between the health care facilities available and the socioeconomic position of the villages, the health care *index of population per health facility* is graphed (figure 6-8). The index shows the very high SEP having over 7000 persons sharing a health care facility. The very low SEP has over 4600 persons sharing a facility.

6.5.2. Socioeconomic quintiles and distance to health facility

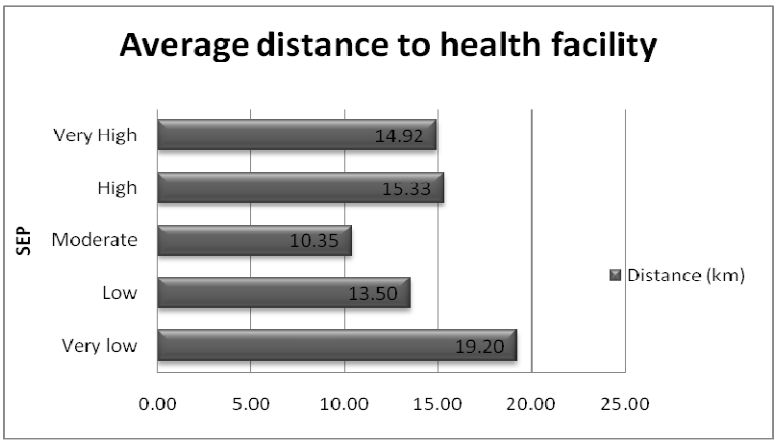


Figure 6-9 SEP and distance to health care facilities
Source: Author's calculation from BPS dataset 2000

This figure 6-9 elaborates on the average distances that villages in each SEP quintile have to trek in order to reach the nearest health facility. It takes about 20km for villages in the very low SEP to reach the nearest health center whereas in the the higher SEPs, it takes a little shorter (approximately 15km).

6.5.3. Assessing predictability of socioeconomic position and public services provision

This section explains the ability of socioeconomic position to predict health care and education provision. The explanatory variables are the *Welfare* and *Assets indices* and the dependent variables are the health indices; *Population per health facility* and *distance to health facilities*.

The results show a very low association ($R^2 < 1$) between the SEP of the villages and the distance to health facilities. The model shows that taking the welfare and assets of the villages into consideration; it is not enough to conclude that distance to health facilities has an association with SEP.

Also a very small relationship is identified between the socioeconomic position of the villages and the population per health facility. The relationship however is not strong enough to say that the SEP of villages has any association with the population per health facility

Last but not the least is the results of the ability of SEP to predict the population per primary school. The socioeconomic positions of villages are able to predict about 5% of the population per primary school. Welfare of the villages contributes about 0.4% of the population per primary school whereas the assets of the villages predict about 1%. The results are not strong enough for SEP to be able to predict the population per primary school.

From the results, it suffices to say that socioeconomic position has no association with the provision of health care and education. The next section looks into the analysis of the level of health care and education provision for the various SEP over time.

6.6. Health and education provision of various socioeconomic positions over time

This section looks into the provision of health and education indicators over time in the SEP quintiles. The indicators are selected based on the consistency of the data from two earlier years i.e. 1993 and 1996. These data are transformed to make them comparable over the years. In all, two indicators are selected one for health care and the other for primary education. The indicators are explained further below.

6.6.1. Relating health care provision and socioeconomic position over time

This section relates the population per health centers over time in the SEP quintiles[5]. This indicator is useful for assessing the availability of health centers over time in the various SEPs.

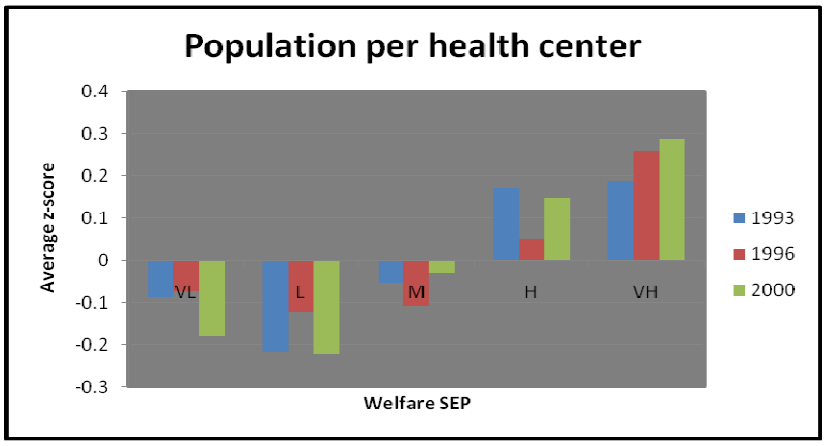


Figure 6-10 Population per health center over time (Welfare-based SEP)
Source: Author's calculation from BPS dataset 2000

From the figure 6-10, population per health center increases in the very low SEP in 1996 and decreases in 2000. On the other hand, the population per health center in the very high SEP increases in both 1996 and 2000. This shows that in the very high SEP, the number of persons sharing a facility has been increasing over the three time periods. The very low SEP quintile has seen a decrease in the number of persons sharing a health facility by the year 2000. This may be attributed to the influx of people from the villages of low SEP to the higher SEPs (Special Province of Yogyakarta 2005).

[5] The SEP quintiles are represented as follows: very high SEP (VH), high SEP (H), moderate SEP (M), low SEP (L), and very low SEP (VL).

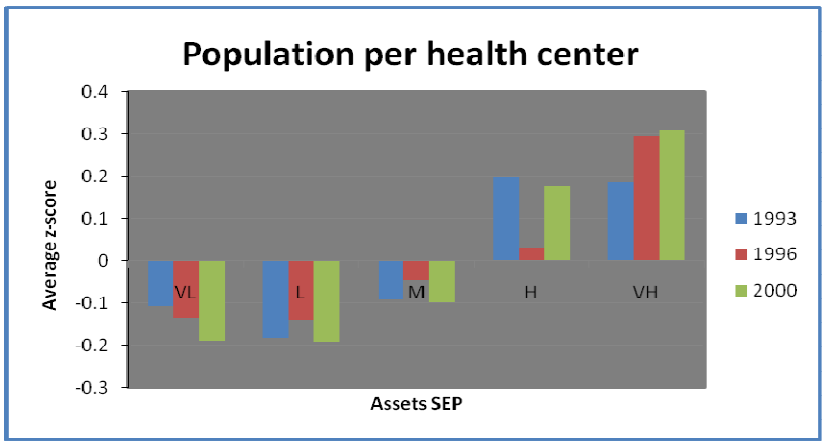


Figure 6-11 Population per health center over time (Asset-based SEP)
Source: Author's calculation from BPS dataset 2000

The relationship is almost the same based on the assets of the villages (figure 6-11). The results show a gradual increase of population per health center over the three years for villages in the very high SEP. However, the population decreases in 1996 and 2000 in the very low SEP.

6.6.2. Relating education provision and socioeconomic position over time

This section looks into the population per primary school over time. This indicator is useful for assessing the availability of primary schools over time in the various SEPs.

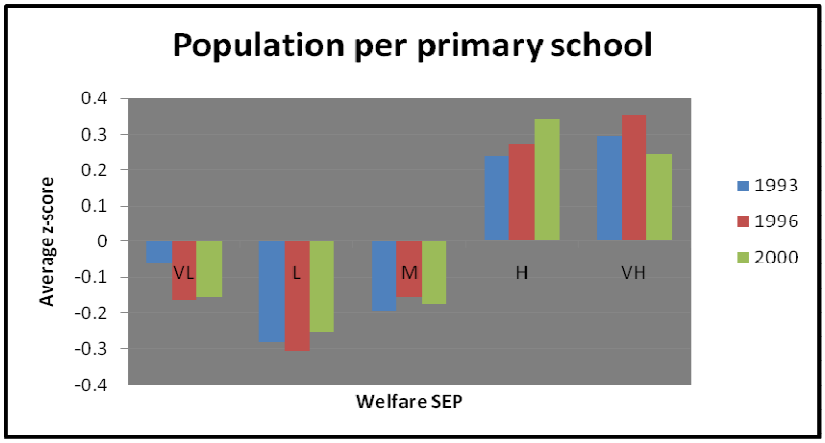


Figure 6-12 Population per primary school (Welfare-based SEP)
Source: Author's calculation from BPS dataset 2000

From the figure 6-12, the population per primary school decreases from 1993 to 1996 but eventually increases slightly in 2000 in the very low SEP. The trend is repeated in the very high SEP as the population increases and decreases in 1996 and 2000 respectively. A policy that is targeted towards increasing the availability of health centers in the very high SEPs might work in this regard.

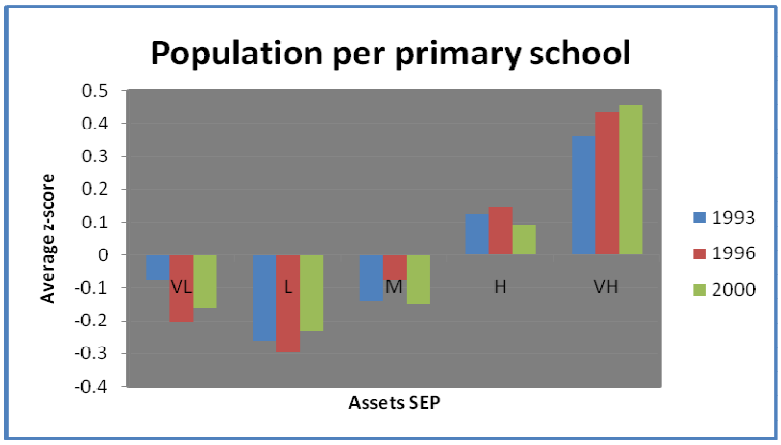


Figure 6-13 Population per primary school (Asset-based SEP)
Source: Author's calculation from BPS dataset 2000

On the contrary, the figure 6-13 indicates that the population per primary school increases for the periods 1996 and 2000. However, the results pertaining to the other quintiles are similar for the Asset SEP.

The results for this section show a recurring issue in the provision of public services. The population per primary school in the very high SEP has been increasing over the three time periods. There is the need for more policies to increase the availability of primary schools in the very high SEP.

6.7. Relating provision of public services to other factors

The results so far indicate that provision of health care and education does not necessarily depend on the SEP of the villages. This section assesses if provision of education and health care has any association with the education and health statuses respectively of the villages. The indicators under consideration as reflecting the health status of the villages include the following:

- ***Sick persons***

This indicator measures the health conditions per village in terms of the number of sick persons over the last one year. It is either seen to be increasing drastically, just increasing, moderate, decreasing or decreasing drastically.

- ***Malnutrition of children under 5***

This indicator also measures the health conditions per village of children less than 5 years of age within the last one year. It is measured in terms of many, some or none.

- ***Malnutrition of children above 5***

This indicator also measures the health conditions per village of children more than 5 years of age. It is also measured in terms of many some or none.

6.7.1. Health status

All the indicators are recoded to follow the format defined for other indicators.[6] The health status indicators are explored with the two health care indices to identify any associations. Chi square test for independence is used for the exploration (see appendices 1 & 2).

[6] The higher the values the worse it is and the lower the value, the better it is.

The results of the Chi-square test for independence with Cramer's V indicates no significant relationship between the villages for which children are malnourished and the population per health facility; χ^2 (n= 438) = 9.813, p = 0.278 and Cramer's V = 0.106.

The indicator (degree to which children under 5 years are malnourished) is tested with the distance to health care facilities and again there is no significant association between the two. Villages with a high number of children under 5 years have no association with the population per health facility and also the distance within which facilities are cited.

To ascertain whether the provision of health care and the distances within which facilities are cited has anything to do with the malnourishment of children more than 5 years of age, a chi-square test is again conducted. The test indicates no significant association between the population per health facility and the villages with malnourished children of more than 5 years of age [χ^2 (n = 438) = 7.065, p = 0.132 and Cramer's V = 0.127]. Furthermore, another test this time involving the distance to health care facilities and villages with malnourished children of more than 5 years of age also yielded insignificant results, indicating no association between the two variables [χ^2 (n = 438) = 7.310, p = 0.120 and Cramer's V = 0.129].[7] This also shows that distance to health facilities is not dependent on villages with a higher number of malnourished children of more than 5 years of age.

The test is again continued to ascertain if population per health facility has any bearings with the number of sick. There is no association statistically from the chi-square; χ^2 (n= 438) = 18.849, p = 0.277 and Cramer's V = 0.104. This indicator also points out no association between the distances within which the health care facilities are cited in the villages and the number of sick persons there. The implication is that the provision of health care facilities does not take into consideration the health care service ranking of the villages.

This section has elaborated on the association between provision of health care and various health statuses. Provision of health care does not depend in any way on the health status of the villages.

6.7.2. Education status

For education, the number of primary school drop-outs is the main indicator of educational status. In order to understand whether the provision of education has anything to do with the educational status of the villages, a chi-square test for independence is used. The test gives χ^2 (n= 438) = 15.066, p = 0.447 and Cramer's V = 0.107. The association is not statistically significant. This implies that the provision of education did not depend per se on the educational status of the villages.

6.7.3. Provision of health care and physical environment

This section assesses whether provision of health care has any association with the physical environment of the villages. The indicators under consideration are pollution of water, air, noise and soil. This is not explored further due to insufficient data.

6.8. Summary and discussion

This chapter has examined the relationship between socioeconomic position and provision of health care and education. The study has adopted an approach that looks initially into the relationship

[7] A significant value needs to have a (probability value) p-value of 0.05 or less.

between the indicators of health care and education as well as that of SEP. The results of the indicators show that villages with more population per health facility are characterised by low ownership of assets, temporary buildings and the like. The results suggest that some villages are better off and others worse off. The provision of health care indicators are studied against the better off (higher SEPs) and worse off (low SEPs) and the relationship at the earlier phase is confirmed that the very high SEP have more population per health facility but less distance to the various health facilities. The very low SEP shows less population per health facility but longer distances to the various health facilities. This is further confirmed in the population per health facilities in general and distance to health facilities against the socioeconomic position quintiles.

This relationship is studied over time and shows that population per health center in the very high SEP have been high over the three time periods. In the low SEP, population has been decreasing which is attributed to the higher numbers of out migration in those areas (Special Province of Yogyakarta 2005). The results also indicate that the population per primary school has always been high in the very high SEP since 1993. It is also realised from the results that provision of health is not based necessarily on the health status of the villages neither is education provision based on the educational status of the villages.

The results follow that realised by Futoshi, Shyamal et al. (2007) in which the provision of primary and health care is seen to be less available over two time periods similar to the last two periods of this study. This trend was realised as a result of high growth rates and population densities arising from in-migration into the province.

7. Conclusion and recommendation

7.1. Introduction

This research is undertaken to determine if areas of high socioeconomic position have higher levels of public services provision. The main findings are summarised in the immediate section below. The chapter concludes with some general remarks and recommendations.

7.2. Summary of findings

The findings of the study are organised in two main ways. The first part elaborates on the conceptual and methodological approach.

The second part entails three sub-sections which are structured according to the sub-objectives.

7.2.1. Conceptual and methodological approach

The study elaborates on two main concepts. Provision of public health care and education is the first concept and embraces any ways of ensuring that services are available in the right quantities and quality. This study looks into the provision of health care and education with the use of indicators selected from relevant literature. It is realised from literature that the use of indicators for quantifying level of health care and education provision varies across developed and developing countries. The selected indicators for health care provision are population per village level health facilities such as health centers, maternity clinics and medicine posts and the distance associated with these facilities. Other indicators are considered but data were not available.

The second concept, socioeconomic position (SEP) is related to the concepts of socioeconomic status and social class. It involves stratification into groups and in this case, stratification of villages. The concept embodies social and economic indicators as a means to describe villages.

The study makes use of principal component analysis (PCA) to generate weights for index construction. PCA is used to derive the indices because of its main advantages over other techniques for combining indicators. It is computationally easier, can work on large datasets such as censuses and involves less subjectivity. In spite of the usefulness of PCA in this study, the analysis put more weight on those indicators that were more unequally distributed across the villages. This implied that the results of the analyses were dependent on the data employed. This weakness of PCA can have effect on the indices generated in terms of the categorisation of villages in to the various socioeconomic positions.

On the other hand, spatial correlation is done to see if there is a spatial clustering of areas of similar levels of health care provision and socioeconomic position. GeoDa was useful in this regard. GeoDa takes into account the spatial distribution of the villages in order to show the clustering of villages of similar circumstances. It however looks into the extremities as it considers areas that are well off and those bad off without any indication of areas that are moderate.

The use of PCA notwithstanding proved very useful as all the indicators were used in the analysis and the results were easily comprehensible. The next section reports some main findings of the study.

7.2.2. Health care and education provision and socioeconomic position

In line with the sub-objectives, the study first assesses the level of health care and education provision in the province of Yogyakarta. The indicators of health care provision are used in various analyses prior to the construction of the indices.

With priority being on the count of health centers, it is realised that 73% of villages in the city of Yogyakarta, the capital of the province are without health centers. The municipalities with the lowest number of villages without health centers are Gunungkidul and Kulonprogo (21%). There is not even a single maternity clinic in the City of Yogyakarta and very few medicine posts are found there. The numbers of medicine posts in general are very few as the municipalities lack between 85% and 91%. The capital lacks a lot of village-level health facilities but cannot be said to be deficient entirely in health facilities. This is because there are a significant number of sub-district hospitals such as integrated health centers, maternity hospitals, polyclinics and other specialist health facilities located in the city. These other health facilities may be playing to a large extent, a role although the study did not consider them in the analysis.

In terms of availability of the various health facilities, the city of Yogyakarta has less available health centers. This is because the number of persons to a health center is very high. Bantul municipality on the other hand has the highest number of persons to maternity clinics and medicine posts. The national standard of number of persons to a health facility is 3000 but all the municipalities exceeded this average. This gives an indication of overcrowding in the various facilities. Availability of health facilities in general is assessed with the *population per health facility index* and the result is similar to that of the indicators. The city of Yogyakarta plays an important role in the entire province and attracts a large number of migrants and also offers employment which has led to a soar in population. The density is too high putting pressure on the few remaining health facilities. The study due to lack of data assumes that all health facilities are of the same capacity which is not likely to be so.

On the flip side, distances to health centers are mostly within 4km with a few villages going up to 38km. Maternity clinics and medicine posts are mostly within 11km and 18km respectively with a few ones up to 99km. This is further evidenced in the distance to health facilities index which shows that in general, the distance to a health facility is shorter in the city of Yogyakarta, Sleman and Bantul municipalities.

There is spatial correlation of villages with similar levels of health care provision. In terms of the population per health facility, areas of lower level provision of health care are found clustered in Sleman and Bantul. Distance-wise, areas of longer distances are spatially clustered in Gunungkidul and Kulonprogo. With higher provision areas clustered together as well as lower provision areas, the tendency for more variations among the two groups is high as a result of segregation.

There are some villages in the rural areas with as many as 31000 persons to a primary school. This figure is far above the national standard of 6000 persons per primary school. The pressure on primary schools is really high and needs some decongestion.

For assessing the socioeconomic position of the villages, socioeconomic indicators are used to develop SEP indices, welfare-based socioeconomic position and asset-based socioeconomic position. The two indices of SEP have 82% of their villages overlapping. Gunungkidul municipality has 66% of its villages among the overlapping villages that fall within the very low SEP. Again this same municipality has no village in the very high SEP. This shows that villages that have problems related to welfare such as higher numbers of the poor, temporary buildings, etc also have higher numbers of people without access to phones, satellite dish, 4 wheels, etc. There is no village in the city of Yogyakarta that falls within the very low SEP.

The study further reveals that SEP cuts across rural and urban villages. About 55% of the villages in the lower SEPs are rural villages as compared to only 2% of the urban villages. There is no urban village within the very low SEP.

A spatial autocorrelation illustrates a clustering of villages of similar SEPs. Lower SEPs are clustered in the municipalities of Kulonprogo and Gunungkidul whereas higher SEPs are clustered in the city of Yogyakarta and Sleman. This shows that segregation persists in the province and has the tendency of widening the inequality gap.

The study further assesses the level of public services among the SEP indicators first and then the quintiles. There is a positive correlation between the percentage of temporary buildings and the distance to health care centers. Villages with higher percentages of temporary buildings experienced longer distances to health care clinics. However, villages with higher percentages of people on poor letters experience shorter distances to health care clinics.

On average, the number of persons found to be sharing a health center is higher (3700 – 6000 persons) than the national standard of 3000 persons. However, the population per health facility generally is about 7000 persons in the very high SEP.

On the part of education, villages with higher numbers of people sharing a primary facility are characterised by lower numbers of people not having 2-3 wheel drives and temporary buildings.

The study further demonstrates if other factors have any relation with the level of services provided. To this, selected health care status indicators such as the sick, malnourished children under and above 5 years are used in a chi square test for independence. None of the indicators shows any association with the provision of health care implying that the provision of health care does not necessarily depend on the health care status of the village. On the flip side, provision of primary school did not necessarily depend on the educational status of the villages.

The observed shorter distances may be attributed to easy connectivity within the city accounting for minimised distances as compared to the less connected municipalities. The higher number of persons sharing facilities in the city and the municipalities of Sleman and Bantul may also be attributed to the rather dense population putting pressure on the limited health care and educational facilities.

For the association between physical environment and provision of health, data constraints and invariability prevented further analysis from materializing.

7.3. Concluding remarks

This study is undertaken to analyse if areas of high socioeconomic position have more services at their disposal. From the study, the villages that fall within the very low SEP have more services but have to trek longer distances to make use of the service. It cannot be said that the higher SEPs are entirely better off either as more people tend to share a health facility. In effect, villages with higher SEP are overcrowded on the one hand and the lower SEPs have longer distances on the other hand.

Correspondingly concerning education, the population per primary school follows a similar trend. Villages of higher SEP tend to have more population per primary school as compared to the lower SEPs. Availability of primary school is therefore low in the higher SEPs.

From the results although socioeconomic position is assessed, the presence of more data would have enhanced the index. This is also true for the health care indices. As realised from literature, other salient indicators such as capacity of health care and education, distance/travel time with regards to education, income, employment details and the like were excluded from the analysis because of inadequate data. The presence of more data would have boosted the indices. As stated earlier, PCA is sensitive to the nature of indicators used therefore the availability of more data would have improved the analysis significantly.

7.4. Policy recommendations

The issue of inequity or variations in the provision of health care and education is heightened when there are less numbers of health facilities than needed and also when the distances to these health facilities are longer than necessary. The study recommends the following to the municipal offices:

- That connectivity within the province is enhanced especially within the western and eastern municipalities to ease the rather long distances of reaching health facilities. This would also improve health care access in the long run.

- The presence of spatial clustering also implies the need for village-specific policies to ameliorate the socioeconomic position of the villages. Clustered villages of lower SEPs may be targeted and their socioeconomic position may be improved through the provision of jobs especially in the dry and hilly rural villages. Another area specific policy could also be in the form of improving the economic potential of these areas.

- A more proactive regulation that would ensure equal distribution of village level public services so as to reduce the variations in the provision of these services and to improve upon the inequity gap.

7.5. Recommendations for future study

The study could have done more than seen here. However, limited time prevented the study from going any further. Therefore in furtherance to this study, any future research related to socioeconomic position and public service provision may be in the light of the following:

- A detailed study into the urban and rural setup in relation to SEP and public service provision. This study briefly highlighted the SEPs of the rural and urban villages but lumped the areas in the

construction of the indices. A detailed study into the rural – urban setup may reduce the effect of stronger urban indicators on the rural indicators.

- This study was limited to only public services. However, a comparative assessment of public provision and private provision of health care and education services against the socioeconomic position of the areas would complement the analyses.

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Appendix

Appendix 1 Crosstab of population per health facility and Above 5 malnourished children

		Population per health facility					
		Very low	Low	Moderate	High	Very high	Total
Rv_Abov5Mal	None	76	76	76	76	89	393
	Some	6	12	12	11	4	45
Total		82	88	88	87	93	438

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.065[a]	4	.132
Likelihood Ratio	7.838	4	.098
Linear-by-Linear Association	.634	1	.426
N of Valid Cases	438		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.42.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	.127			.132
	Cramer's V	.127			.132
Interval by Interval	Pearson's R	-.038	.041	-.796	.426[c]
Ordinal by Ordinal	Spearman Correlation	-.039	.041	-.820	.413[c]
N of Valid Cases		438			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Appendix 2 Crosstab of distance to health facility and Above 5 malnourished children

		Distance to health facility					
		Very short	Short	Moderate	Long	Very long	Total
Above 5 Malnourished children	None	80	80	78	83	72	393
	Some	7	8	10	5	15	45
Total		87	88	88	88	87	438

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.310[a]	4	.120
Likelihood Ratio	7.004	4	.136
Linear-by-Linear Association	2.098	1	.148
N of Valid Cases	438		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.94.

Symmetric Measures

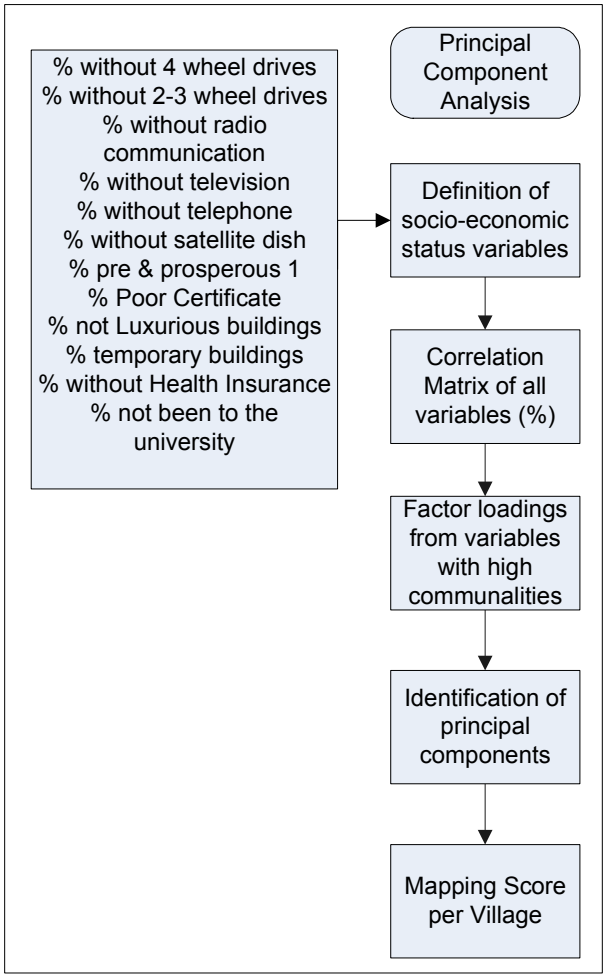
		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Nominal by Nominal	Phi	.129			.120
	Cramer's V	.129			.120
Interval by Interval	Pearson's R	.069	.050	1.450	.148[c]
Ordinal by Ordinal	Spearman Correlation	.069	.050	1.448	.148[c]
N of Valid Cases		438			

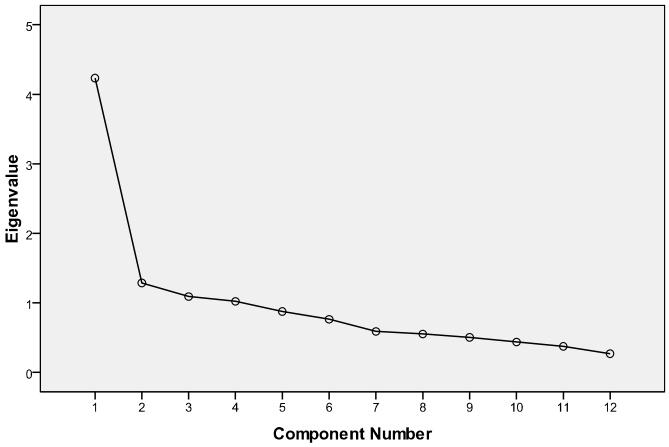
a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

Appendix 3 Principal component analysis for SEP and scree plot





Appendix 4 Rotated component matrix for SEP

	Components			
	1	**2**	**3**	**4**
Temporary	.791	.123		
Poor	.784		-.292	
Insurance	.744		.227	
2-3 Wheels	.678	.394		.111
TV	.661	.481		.151
Phone	.246	.754		.209
Radio	.219	.671	-.128	
Education	.399	.604		
Satellite	-.167	.595	.111	
4 - Wheels	.272	.512		
Poor letters			.959	
Luxury				.979

Appendix 5 Total variance explained from PCA for SEP

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.233	35.274	35.274	4.233	35.274	35.274	3.068	25.570	25.570
2	1.287	10.725	45.999	1.287	10.725	45.999	2.417	20.141	45.712
3	1.091	9.093	55.092	1.091	9.093	55.092	1.097	9.139	54.850
4	1.022	8.514	63.606	1.022	8.514	63.606	1.051	8.756	63.606
5	.876	7.301	70.907						
6	.765	6.372	77.279						
7	.589	4.912	82.191						
8	.552	4.602	86.793						
9	.504	4.196	90.989						
10	.438	3.649	94.638						
11	.374	3.121	97.759						
12	.269	2.241	100.000						

Extraction Method: Principal Component Analysis.

Appendix 6 Sample correlation of SEP indicators

	Temporary	Poor	Poor letters	Luxury	4 Wheels	2-3 Wheels	Satellite	TV	Radio	Phone	Insurance	Education
Temporary	1	.566**	.105*	0.026	.258**	.484**	0.09	.508**	.256**	.258**	.498**	.361**
Poor	.566**	1	-.127**	0.05	.220**	.493**	0.045	.471**	.238**	.283**	.453**	.331**
Poor letters	.105*	-.127**	1	0.022	-0.006	0.088	0.009	0.052	-0.045	0.037	.178**	0.043
Luxury	0.026	0.05	0.022	1	0.003	0.075	-0.016	.116*	-0.022	.128**	0.042	0.024
4 Wheels	.258**	.220**	-0.006	0.003	1	.268**	.121*	.432**	.279**	.333**	.234**	.347**
2-3 Wheels	.484**	.493**	0.088	0.075	.268**	1	.133**	.693**	.350**	.447**	.446**	.469**
Satellite	0.09	0.045	0.009	-0.016	.121*	.133**	1	.150**	.150**	.268**	0.02	.149**
TV	.508**	.471**	0.052	.116*	.432**	.693**	.150**	1	.385**	.507**	.474**	.467**
Radio	.256**	.238**	-0.045	-0.022	.279**	.350**	.150**	.385**	1	.491**	.234**	.424**
Phone	.258**	.283**	0.037	.128**	.333**	.447**	.268**	.507**	.491**	1	.288**	.485**
Insurance	.498**	.453**	.178**	0.042	.234**	.446**	0.02	.474**	.234**	.288**	1	.312**
Education	.361**	.331**	0.043	0.024	.347**	.469**	.149**	.467**	.424**	.485**	.312**	1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 7 Correlations between SEP indicators and population per primary school

Correlations	
	Population per primary
Temporary	-.122*
Poor	-.176**
Poor letters	.010
Luxury	.006
4 - Wheels	-.127**
2-3 Wheels	-.164**
Satellite	-.078
TV	-.152**
Radio	-.085
Phone	-.192**
Insurance	-.192**
Education	-.136**

Appendix 8 Computing socioeconomic indices

SEP_WELFARE = (p_temporary * 0.791) + (p_poor * 0.784) + (p_insurance * 0.744) + (p_h2_3wh * 0.678) + (p_tv * 0.661) + (p_phone * 0.246) + (p_radio * 0.219) + (p_education * 0.399) - (p_satellite * 0.167) + (p_h4wh * 0.272) + (p_prcert) + (p_luxury)

SEP_ASSET = (p_temporary * 0.123) + (p_poor) + (p_insurance) + (p_h2_3wh * 0.394) + (p_tv * 0.481) + (p_phone * 0.754) + (p_radio * 0.671) + (p_education * 0.604) + (p_satellite * 0.595) + (p_h4wh * 0.512) + (p_prcert) + (p_luxury)

Where P_temporary = Percentage of houses that are temporary
P_poor = Percentage of households that are poor
P_insurance = Percentage of households without health care insurance
P_h2_3wh = Percentage of households without 2_3wheel drives
P_tv = Percentage of households without tv
P_phone = Percentage of households without phones
p_radio = Percentage of households without radio communication
P_education = Percentage of households whose children have not studied in the university
p_satellite = Percentage of households without satellite dish
p_h4wh = Percentage of households without 4 wheel drives
P_prcert = Percentage of households that received poor letters
p_luxury = Percentage of buildings that are not luxurious

Appendix 9 Correlation of health care provision indicators

	Distance_HC	Distance_MC	Distance_MP	Population_HC	Population_MC	Population_MP	Ease_HC	Ease_MC	Ease_MP
Distance_HC	1	.020	.029	-.353**	-.012	-.060	.538**	-.046	.049
Distance_MC	.020	1	.258**	-.036	-.272**	-.066	.038	.502**	.155**
Distance_MP	.029	.258**	1	-.057	.051	-.211**	-.017	-.030	.573**
Population_HC	-.353**	-.036	-.057	1	.225**	.206**	-.631**	-.046	-.081
Population_MC	-.012	-.272**	.051	.225**	1	.090	-.103*	-.735**	-.039
Population_MP	-.060	-.066	-.211**	.206**	.090	1	-.083	-.039	-.617**
Ease_HC	.538**	.038	-.017	-.631**	-.103*	-.083	1	.093	.083
Ease_MC	-.046	.502**	-.030	-.046	-.735**	-.039	.093	1	.127**
Ease_MP	.049	.155**	.573**	-.081	-.039	-.617**	.083	.127**	1.000

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 10 Distribution of SEP quintiles across municipalities

	Municipality	Frequency	Percent (%)	Cumulative Percent
1 Very high	Bantul	14	16.1	16.1
	Sleman	41	47.1	63.2
	Yogyakarta	32	36.8	100.0
	Total	**87**	**100.0**	
2 High	Kulonprogo	14	15.9	15.9
	Bantul	29	33.0	48.9
	Gunungkidul	5	5.7	54.5
	Sleman	28	31.8	86.4
	Yogyakarta	12	13.6	100.0
	Total	**88**	**100.0**	
3 Moderate	Kulonprogo	28	31.8	31.8
	Bantul	22	25.0	56.8
	Gunungkidul	24	27.3	84.1
	Sleman	13	14.8	98.9
	Yogyakarta	1	1.1	100.0
	Total	**88**	**100.0**	
4 Low	Kulonprogo	23	26.1	26.1
	Bantul	6	6.8	33.0
	Gunungkidul	57	64.8	97.7
	Sleman	2	2.3	100.0
	Total	**88**	**100.0**	
5 Very low	Kulonprogo	23	26.4	26.4
	Bantul	4	4.6	31.0
	Gunungkidul	58	66.7	97.7
	Sleman	2	2.3	100.0
	Total	**87**	**100**	

Glossary of terms and abbreviations

NZDep Scale	A ten category ordinal scale with 1 being least deprived and 10 being most deprived. These deciles are used to rank areas in New Zealand based on an index of deprivation.
Principal Components Analysis	A multivariate technique that explains observed variations in data and in so doing reduces complex data into simple and understandable one.
SPSS	It is an analytical tool used for the computation of statistics. PCA is an aspect of this package. It is with effect from 2009 re-branded as PASW (Predictive Analytics Software).
Deprivation	Linked to ways in which households live and work, the access they do or do not have to collective state-provided resources and the extent to which poor households can make their needs heard politically or can organise collectively to build up assets (Baud, Sridharan et al. 2008).
Socioeconomic position	The broad circumstances by which an individual can be hierarchically stratified
Poverty	Lack of command over basic consumption needs (Ravallion and Bidani 1994)
Social exclusion	It occurs when people are denied equal access to rights and resources (de Haan 2004)
Village level	This refers to the lowest administrative unit of Yogyakarta which is used as the scale of analysis for this study. It contains aggregate data of households based on the 2000 population census