Evaluating access to primary health care
The case of Kigali, Rwanda

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by

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Abstract

Access to primary health care is an important concern in health policy and research. Yet despite high attention devoted to it, it is has been poorly defined and operationalized. The aim of this study was to develop a framework of properly defining and measuring the concept of access using the city of Kigali as a case study.

The research is based on the review of the literature, secondary and primary data related to access. During this research it has been concluded that access in a multidimensional concept composed by geographical accessibility, availability, affordability, accommodation and acceptability.

The operationalization was mainly based on primary data but also used limited secondary data to assess variation in terms of the five access dimensions.

The results show that access in is achieved in terms of geographical accessibility, affordability, and acceptability. Accommodation was found problematic with issues related to patients waiting time at health centers before getting check up and longer waiting times for laboratory results.

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Table of contents

1. Introduction 1
1.1. General introduction 1
1.2. Research problem and justification 1
1.3. Research objectives 2
1.4. Research questions 2
1.5. Scope of the study 3
1.6. Research framework 3
1.7. Limitations of the research 4
1.8. Structure of the report 5
2. Review of the concept of access to health care 6
2.1. Defining access to health care 6
2.1.1. Access as the characteristics of populations and health care delivery system 6
2.1.2. Access as the fit between user and system characteristics 7
2.2. Defining access dimensions 8
2.2.1. Accessibility 8
2.2.2. Availability 8
2.2.3. Affordability 9
2.2.4. Accommodation 9
2.2.5. Acceptability 9
2.3. Operationalization of access dimensions 10
2.3.1. Operationalization of accessibility 10
2.3.2. Operationalization of availability 11
2.3.3. Operationalization of affordability 11
2.3.4. Operationalization of accommodation 12
2.3.5. Operationalization of acceptability 12
2.4. Critical reflection on the definitions and operationalization of access dimensions 13
2.5. Objectivity and subjectivity in the measurement of access 13
2.5.1. Objective measures of access 13
2.5.2. Subjective evaluation of access 14
2.6. Alternative methods to measure access 15
2.6.1. Geo Information Science and access measurement 15
2.6.2. Alternative methods for measuring non spatial aspects of access 16
2.7. Framework of evaluating access 16
2.8. Concluding remarks 17
3. Study area description 18
3.1. Background 18
3.2. Physical characteristics 18
3.3. Administrative units 19
3.4. Spatial expansion and demographic characteristics 20
3.5. Land use 21
3.6. Health care facilities 22
3.7. Health care organization and management in Rwanda 23
3.7.1. Health care package 23

3.7.2. Health care management 23
3.8. Rwanda National Health policy 24
3.8.1. Health care financing 24
3.9. Standards of spatial accessibility and availability 25
3.10. Standards of human resources for health centers 25
4. Research methodology 27
4.1. Data collection 27
4.1.1. Preparation of field data collection 27
4.2. Actual data collection 30
4.2.1. Primary data collection 31
4.2.2. Secondary data collection 31
4.3. Data analysis 33
4.3.1. Description of individual variables used to measure access dimensions 33
4.3.2. Discriminant validity of access dimensions and Identification of underlying indicators 36
4.3.3. Creation of composite measures of access dimensions 36
4.3.4. Evaluation of access in line with health policy 36
4.3.5. Comparison of access attainment between health centers. 36
5. Evaluation of access to primary health care 37
5.1. Health centers characteristics 37
5.1.1. Population coverage and attendance rates 37
5.1.2. Human resources 38
5.1.3. Available Services 38
5.1.4. Health centers equipment 39
5.1.5. Operational organization 39
5.1.6. Services payment 39
5.2. General characteristics of patients 40
5.3. Analysis of individual indicators of the five dimensions 41
5.3.1. Geographical Accessibility 41
5.3.2. Availability 47
5.3.3. Affordability 48
5.3.4. Accommodation 49
5.3.5. Acceptability 50
5.4. Overall evaluation of access dimensions 50
5.4.1. Discriminant Validity test of access dimensions 51
5.4.2. Selection of underlying indicators of access dimensions 52
5.4.3. Creation of composite measures of access dimensions. 53
5.4.4. Comparison of access dimensions scores between health centers 55
6. Reflection on research methodology and results 56
6.1. Definition and operationalization of the concept of access to primary health care 56
6.2. Data requirements and data analysis 57
6.3. Access attainement in line with health planninga and policy standards 57
6.4. Main issues in health care delivery 58
6.5. Recommendations 59

List of figures

Figure 1-1Research framework 4
Figure 2-1 Access framework 17
Figure 3-1 Location of Kigali city 18
Figure 3-2 Topography of Kigali 19
Figure 3-3 Administrative map of Kigali city 20
Figure 3-4 Population density in Kigali city 21
Figure 3-5 Land use in Kigali city 22
Figure 3-6 Location of public health facilities 23
Figure 4-1 Location of sample health centers 28
Figure 5-1 Population served by health centers 37
Figure 5-2 Number of patients received per day 38
Figure 5-3 Distribution of medical staff per health center 38
Figure 5-4 Distribution of hospital beds per HC 39
Figure 5-5 Location of visited health centers and origin of sample outpatients 40
Figure 5-6 Walking distance to the nearest health center with 30 minutes thresholds 42
Figure 5-7 Euclidian distances to health centers 43
Figure 5-8 Network based travel distance to the nearest HC 43
Figure 5-9 Origin cells of patients and visited health centers 46
Figure 5-10 Distribution of served population by health center 48
Figure 5-11 Satisfaction with service costs 49
Figure 5-12 Satisfaction with waiting time *for laboratory results* (*a)* 50
Figure 5-13 Satisfaction for consultation waiting time (b) 50
Figure 5-14Overall composite scores of access dimensions 54

List of tables

Table 1-1 Research questions 2
Table 3-1 Population evolution in Kigali 21
Table 3-2 Land use types in Kigali 22
Table 3-3 Standards OF Human resources in health centers 26
Table 4-1Spatial data set used in spatial analysis 32
Table 4-2 Hexagonal tessellation and Population disaggregation 35
Table 5-1 Characteristics of sample patients 41
Table 5-2 Satisfaction with travel distance 44
Table 5-3 Population distribution within different travel time thresholds 45
Table 5-4 Population and travel time in planned and unplanned urban area 45
Table 5-5 Satisfaction with offered services 47
Table 5-6 Underlying indicators retained for composite measures 53

1. Introduction

The present chapter introduces the research work undertaken, by describing the context within which the study was conducted. The research problem is briefly described and research objectives are defined, followed by a series of research questions aimed to guide research methods. In this chapter the framework and the scope of the research are also presented and at the end of the chapter the outline of the report is also highlighted.

1.1. General introduction

Good health is a cornerstone of development. It is not only a basic human right, but also a key precondition to economic development and unarguably, the wealth of a country is judged by the health of its population (OECD 2003). According to Thomas et al (2004), there is a strong positive association between health and economic prosperity as healthier workers are more alert and more energetic, thus, more productive and command higher hourly earnings.

However, during the past two decades, Sub-Saharan African countries have been characterized by an alarming increase of burden of diseases once thought to be well controlled such as malaria, cholera, tuberculosis, etc. while also being threatened by epidemics, notably HIV/AIDS (Sanders 2005). These diseases cause high rates of morbidity and mortality and constitute major barriers to economic growth. Whiting and Unwin (2008) state that the major reasons behind these poor health outcomes are the lack of population's access to primary health care services.

Access to primary health care was identified by the World Health Assembly in 1977 as the desirable main target of improving population's well being in developing countries. Later, in 1978, primary health care access was widely recognized by the Alma Ata declaration as an imperative strategy to the achievement of "health for all" and a universal solution to reach the Millennium Development Goals (WHO 2008).

Similarly to other Sub-Saharan African countries, the provision of primary health care is considered in Rwanda as an indispensable strategy for achieving good health for all, rather than just the first level of care. However, in Rwanda, the late1980s was characterized by socio-political instability, and the beginning of the HIV/AIDS pandemic, followed by the worsening of economic performance. All this disorder inflicted the elaboration and implementation of primary health care policies and plans that the country had. Furthermore, Rwanda's health system has been shortage of health staff, inequity of access, and poor quality of care in health facilities even though there was some initial progress in improving health status. Based on these observations, there is a need to ensure access to primary to Rwandan population.

1.2. Research problem and justification

According to Murad (2007), evaluating access to health care is one of the major tasks which should be covered by health planners. Black *et al.*(2008) state that measuring access to health care contributes to a wider understanding of the performance of health systems and facilitates the development of evidence based

health policies. However, over time, the concept of access to health care has been characterized by a lack of proper definition and thus has been inadequately operationalized. It has been operationalized mostly by considering its spatial component, overlooking other non-spatial factors that might influence it. Our research aims to bridge this gap by introducing an approach sought to properly define the concept of access to health care and to operationalize it by considering not only the spatial component but also other aspects that may determine it. The interest in using the city of Kigali as the case study was based on the fact that no study of this kind has been conducted in this city before and thus the expected results may help planners and decision makers to improve access to health care planning and delivery in accordance with the current health policy. It is worth to recall that the Kigali is a typical Sub-Saharan African city, characterized by the same health challenges linked to rapid and uncontrolled urban growth, where insuring access to primary health care should figure among the major priorities.

1.3. Research objectives

The main objective of the research is to develop an approach which can be used to evaluate access to primary health care.

The main objective is subdivided into the following specific objectives:

1. To develop a framework of defining and operationalizing the concept of access to health care.
2. To apply the developed framework in the evaluation of access to primary care using the city of Kigali as a case study.

1.4. Research questions

Below listed are questions sought to operationalize the specific objectives of the research.

Specific objectives (1)	**Research questions**
To develop a framework of defining and operationalizing the concept of access to health care.	(1) How can the concept of access to health care be properly defined? (2) How can the concept of access to health care be operationalized? (3) What are different alternative methods of measuring access to health care?
Specific objectives (2)	**Research questions**
To apply the developed framework in the evaluation of access to primary care in the city of Kigali	(4) How presently is the concept of access to health care conceptualised and operationalized in Rwanda? (5) What are the data needed to evaluate access in Kigali and how can they be obtained? (6) What different alternative ways of analyzing those data? (7) At what level is access attained in Kigali line with National health planning and policy standards? (8) What are the prevailing issues regarding access to primary health care in Kigali?

Table 1-1 Research questions

1.5. Scope of the study

As stated in the objectives, the central theme of this research is the evaluation of access to health care. However, all levels of health care were not embraced by the study. *First*, the research has only focussed on the package of health care provided by government health facilities; thus private health care was not touched upon and the reason is that, public health facilities are the most concerned with National health policy. *Second*, the emphasis is on the basic level of health care referred to as primary health care, provided at health center level, thus secondary and tertiary health care were not included in the research.

1.6. Research framework

The conceptual framework of this research, as presented in figure 1-1, is centered on the definition and operationalization of the concept of access to health care. The pillar of the work is a framework introduced by Penchansky and Thomas (1981), which is an explicit recognition of the range of factors that influence health services use and outcomes. Such view of access is not only perceived by many as more explicit but also is useful for the policy point of view as it facilitates the focus of policy actions on specific issues that hinder services delivery.

The review of health care access related literature was useful, in the suggestion of a good definition of access concept as well as its operationalization approach. The collection of empirical and secondary data was indispensable for the assessment of factors influencing the use and outcomes of health services in the context of the given case study (Kigali). The major steps followed through this research can be summarized as follows.

First a multidimensional definition of access is sorted out, suitable for different contextual settings, then the definition of access leads to the selection of relevant indicators which can be used to operationalize the concept of access along with the choice of proper methods to be applied in the measurement of its various dimensions. The identification of relevant indicators led to the selection of secondary and empirical data needed in the evaluation of access within the context of the study area. Empirical data are related to the health system characteristics, population characteristics, services use and services outcomes (satisfaction), not that objective and subjective measures were used in data collection.
Geographic Information System (GIS) and statistical methods along with qualitative analysis (interpretation) were used in the analysis of collected data. The benchmark considered for the evaluation of access is the prevailing planning standards for health care in case it was available, along with satisfaction as the user's judgemental evaluation of access to health care.

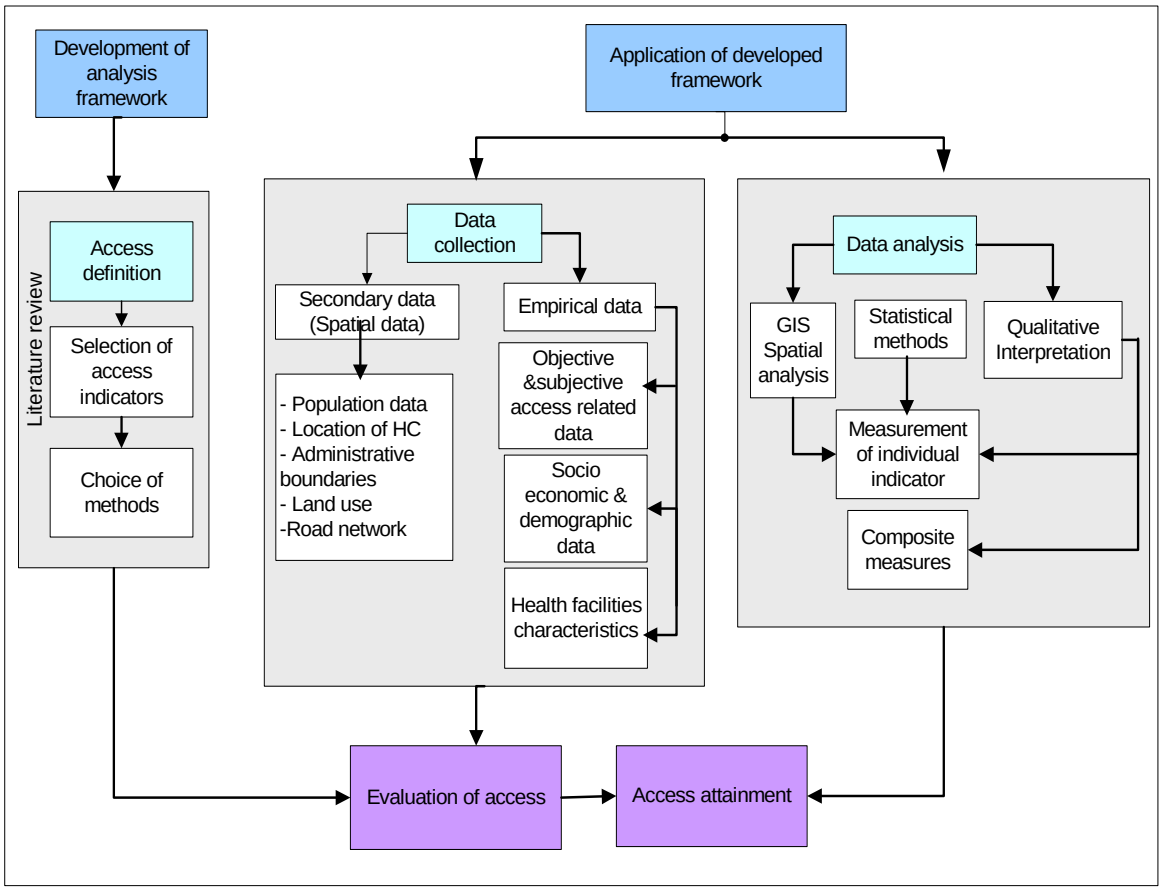


Figure 1-1Research framework

1.7. Limitations of the research

By its nature, the social aspect of this research required an indispensable acquisition of primary data which would not be obtained without field work. However the way in which the patients' questionnaire survey was conducted was challenging. Although the survey was perceived successful, despite the lack of presence from ITC on the field, there were a number of issues faced. The main problem encountered was the attempt to conduct the field work from a distance in line with limited experience in carrying out a survey in the area of health research. The survey team had the responsibilities of submitting the letter of request to various health centers in quest of permission to start data collection and in some cases the permission has been denied or delayed. Even though there was precious support from CGIS staff members, some problems were beyond their control. For this reason the sample of health centers had to be modified and there were inclusions of facilities which were not thought of before. There was also supposed to be regular contact between the author and the survey team but due to limited time allocated to survey this was not possible.

Above all, the tardiness in commencing the survey had a major effect on the progression of the research itself. Receiving data later than planned resulted in the delay of data analysis as there was important data processing to be done. Also, not being able to visit the study area prevented the author from gaining firsthand experience of the phenomenon. Another issue was the lack of sufficient secondary data related to access and this has led to limitations in spatial analysis of access.

The revision of the questionnaire during data collection in order to adapt it to the field reality has led to unexpected changes such as the aggregation of five points Likert scale answers into three points scale in order to standardize the responses to subjective questions and this was not expected.

1.8. Structure of the report

This thesis comprises **7** chapters described as follows:

The **first chapter** is an introductory chapter, describing research objectives, research questions, research problem, research justification and research framework.

The **second chapter** provides a systematic theoretical background related to the concept of access, through the review of the literature. It depicts different frameworks of definition of the concept of access to health care and its operationalization approaches.

The **third chapter** describes the study area. It discuss the administrative configuration of the city of Kigali, the location of health care facilities, the population densities, urbanization levels and the prevailing National health care organization, its planning and policy.

The **fourth chapter** comprised the methodology adopted to answer the research questions. It describes how the process of data collection was prepared, and carried out and how the collected data were analyzed.

The **fifth chapter** presents the results obtained from the analysis.

The **sixth chapter** is the discussion of the results obtained from the analysis in order to reflect to the achievement of research objective. It is combined with the general conclusion of the study and recommendations addressed for future research as well as few related to primary health planning.

2. Review of the concept of access to health care

This chapter is a systematic review of the concept of access to health care. It is based on an exploration of health care access related literature, describing different frameworks sought to define and operationalize the concept of access over time. Based on the literature, a proper definition of access is selected along with a relevant approach which can be used to operationalize and evaluate access in the context of the study area.

2.1. Defining access to health care

Access is an important concept in studying the organization and delivery of healthcare services and it has been central to health services research and policy for many years. Yet, despite the high amount of studies to which it has been subject, this concept has not been precisely defined or operationalized. Savedoff (2009) claims that in spite of ubiquitous use of access concept in health related literature, it is often left undefined. Andersen (1995) and Crall (2006) among many authors admitted that access is a very complex concept. Because of the difficulties in sorting out its definition, a considerable number of access frameworks have led to a variety of definitions. Some of those definitions have approached access in a more conceptual angle while others have opted for a broader and elaborate perspective. Various definitions of access documented in the literature differ in a twofold perspective. The *First* perspective is that of conceptual or narrow definition, confined either to the "*characteristics*" of the population or to those of the health delivery system. The *second* perspective relates to a broader angle of access and describes it as a multidimensional concept which goes beyond health services users and system characteristics. It rather reflects the *"fit"* between population and health system characteristics.

2.1.1. Access as the characteristics of populations and health care delivery system

Many studies sought to elucidate the definition of access have equated it with various characteristics of individuals such as income, insurance coverage and the characteristics of health care delivery system resources such as the spatial proximity of health facilities or the number of providers. For example Crall (2006) defined access as the ease with which health care can be reached in the face of financial, organizational, cultural, and emotional barriers. Several other authors have sorted out conceptual definitions of access more or less similarly to the previous one. We can recall among others (Timmreck 2003), (Khan 1994) and (O'Donnell 2007).

A framework based on the model promulgated by Andersen *et al.* (1983) identifies three types of individual determinants of access: *predisposing, enabling, and need*. Predisposing characteristics generally are referred to as various socio-demographic factors such as race, gender, educational attainment and occupation, that measure individual biological and social structural traits. Within this perspective, individual health beliefs and attitudes are thought to contribute to a person's predisposition for health care utilization. Enabling characteristics are described as those which facilitate individuals' use of health care services and include individual financial and other resources. Finally, needs are related to whether individuals perceive that their condition necessitates medical care, whether they think this care is of value, and the degree to which a health care professional believes an individual needs care. In recent times, the model has expanded to include variables that describe the characteristics of the health care delivery system such as policies, resources, and organization, external environmental factors such as economic climate, relative wealth, politics, violence and

community-level enabling characteristics such as the availability of physicians within the community. Although access is depicted in details within this framework, its definition still turns around the characteristics of people and health system and it does not differ much from those introduced previously.

Almost similarly to the framework of Andersen and colleagues, Millman (1993) also distinguish three main categories of access factors namely: *structure barriers* described as the number, type, concentration, location and organization of health care), financial *barriers* identified as those factors which inhibit the ability of patients to pay for needed services such as insurance coverage or income, and finally *personal and cultural barriers* such as education level, religion, age, gender, personal beliefs etc.

The previous style of defining access has been contested in various ways. For example with regard to the previous definition, Aday and andersen (1974) and Millman (1993) have criticized the fact that access has mostly been taken as synonymous with the presence of health system resources in an area while in a similar way, Gulzar (1999) has also questioned the way researchers and theorists equate access with the presence of specific characteristics of the population such as income and insurance. From this criticism, it can be deducted that access should not be measured uniquely on the basis of the spatial proximity of health facilities or just the presence of resources. These are not sufficient to guarantee that people who need services will get them in a proper way. Also equating access with presence of resources will miss other characteristics of the provider and the clients that may influence access. According to Andersen *et al.*(1983) these definitions uniquely reflect the probable or potential levels of access to medical care and do not portray the reality. An additional major shortcoming of this definition is the fact that it does not depict how the concept of access should be operationalized.

2.1.2. Access as the fit between user and system characteristics

In various literatures, several attempts have been made, to adjust the definition of access by compensating for the gap left within the previous perspective which was limited to user-systems characteristics. In this respect, with the aim to provide a definition of access which not only facilitates the understanding of the concept, but also its operationalization, Penchansky and Thomas (1981) have introduced a framework within which access is defined as a multi dimensional concept, reflecting the fit between characteristics and expectations of providers and those of clients. Contrary to the previous definitions, this *"fit"* perspective goes beyond potential characteristics by embracing not only the use of services but also services outcomes. Penchansky and his colleague subdivided access concept into *five dimensions* also referred to as *the five "As" of access* namely accessibility, availability, affordability, accommodation, and acceptability. The interrelationship between the five dimensions has also been admitted. For example Anderko *et al.* (2000) state that variations in any of these dimensions can affect each of the other dimensions and, ultimately, client satisfaction and service utilization.These dimensions will be further developed through subsequent lines.

This framework of access conceived by Penchansky and his colleague has gained more grounds in health related research, praised for its explicitness and its provision of an operational scale to measure outcomes of services.

It can be concluded that the framework of access proposed by Penchansky and colleague is more suitable for the evaluation of access. Thus access may be defined as those dimensions which describe the potential and actual entry of a given population to the health care delivery system. From its "*fit*" perspective it can be deducted that the five dimensions embrace both services use and outcomes as yardsticks of judging weather

access has been achieved or not. Andersen *et al.*(1983) argue that access can best be evaluated through outcome indicators of the individual's passage through the system, such as utilization rates or satisfaction. In brief, they admitted that it is the use of service and outcomes of the use process that could be used to measure access. These measures, they argue, permit "external validation" of the importance of the system and individual characteristics. Utilization and satisfaction may be more appropriately considered as objective and subjective indicators of access to services.

This framework based on the five dimensions has served as the pillar for many subsequent access related studies, most of which have taken up the five dimensions entirely while few considered only some dimensions. For example Gulzar (1999), Bagheri and Benwell (2005), Unal *et al.*(2007), Susan and Pei-Shu (2007) and Black *et al.*(2008) referred to five dimensions of access similar to those conceived by Penchansky and Thomas, while Gulliford and Morgan (2003) and O'Donnell (2007) have limited their focus on four dimensions, namely accessibility, availability, affordability and accommodation.

2.2. Defining access dimensions

As described in the previous section, access to health care is a multidimensional concept with five main components namely geographical accessibility, availably, affordability, accommodation and acceptability. The following lines describe one by one, each of the five dimensions of access, giving insight on how they are defined by different authors and proposing the suitable definitions based on different criteria such as the normative assessment, the contextual application and the explicitness.

2.2.1. Accessibility

The dimension of accessibility has relatively received more attention in health related studies compared to other dimensions of access. Within some studies, the dimension of accessibility is specifically referred to as *"locational accessibility"* (Brabyn and Skelly 2002) or "*geographical accessibility*" (Love and Lindquist 1995), (Brabyn and Skelly 2002), (Apparicio *et al.* 2008) and many more. It is also referred to as "*physical accessibility"* by numerous researchers among which Lee and MacNally (2002) and Black *et al* (2008). Another term commonly used in the literature to describe the dimension of accessibility is "*spatial accessibility*". This term has been used in various studies such as those conducted by Gulzar (1999), Guagliardo (2004), Unal *et al.*(2007), Black *et al* (2008) and others which have not been mentioned in this report.

Penchansky and Thomas (1981) defined geographical accessibility as the relationships between the location of providers as supply and the location of population as clients. According to Gulliford and Morgan (2003) it is the ease or difficulty of reaching health services taking into account the location of services in relation to the population location and means of transportation to reach those services. for Bagheri and Benwell (2005) and Unal *et al* (2007), geographical accessibility means the travel impedance to health care providers. Leisinger (2008) defines accessibility as the extent to which the geographical location of health service delivery coincides with the location of clients. Wyszewianski (2002) describes accessibility as the ease of clients to physically reach health care providers location, while Ray and Ebener (2008) describe it as the physical distance from service delivery point to the user.

2.2.2. Availability

Penchansky and Thomas (1981) and McCaughrin (1996) defined the dimension of availability as the relationship between the volume and type of existing services and the client's volume and types of needs. As

from Gulliford and Morgan (2003) it is the extent to which health care resources in terms of volume and capacity are mobilized to meet the needs of different groups of the population. According to Obrist *et al.*(2007) availability refers to the extent to which offered products and services correspond with the needs of people. Leisinger (2008) describe availability as the degree of fit between existing health services and clients' needs. As for Wyszewianski (2002) availability is defined as the extent to which the provider has the requisite resources, such as personnel and technology, to meet the needs of the clients. As from McIntyre *et al.*(2009) availability is the relationship between the type, range, quantity and quality of health services provided at a facility and the nature and extent of the health needs of the community being served, while according to Ray and Ebener (2008), it is the ability of having the right type of care to those who need it.

2.2.3. Affordability

Affordability often referred to as financial accessibility is also characterized by some similarities in its definition. It is described by Penchansky and Thomas (1981), McCaughrin (1996), Gulliford and Morgan (2003), Bagheri and Benwell (2005) and Leisinger (2008) as the relationship between the costs of health services and the income and ability of providers to pay for services. According to McIntyre *et al* (2009) affordability means the degree of fit between the full costs and individual's ability to pay, in the context of the household budget. Ray and Ebener (2008) define it as the relationship between the price of health services and the willingness and ability of users to pay for those services.

2.2.4. Accommodation

Some authors such as Bagheri and Benwell (2005), Obrist *et al.*(2007) and Leisinger (2008) use the term adequacy to relate to the dimension of Accommodation. They describe it as the degree to which services are organized to meet patient's needs and expectations. As defined by Penchansky and Thomas (1981) accommodation means the relationship between the manner in which the supply resources are organized to accept clients and the clients ability to accommodate to that organization. McCaughrin (1996) described accommodation as the organization's willingness to adopt certain operating practices in relation to clients' abilities to utilize these services. Wyszewianski (2002) defined it as the extent to which the provider's operation is organized in ways that meet the constraints and preferences of the clients while according to McIntyre *et al* (2007), accommodation specifically reflects the degree of fit between the hours of service of health care facilities and the time when it is feasible for individuals to attend for care.

2.2.5. Acceptability

The dimension of acceptability, sometimes referred to as cultural acceptability is defined by Penchansky and Thomas (1981) as the extent to which the client is comfortable with the more immutable characteristics of the provider, and vice versa. According to McCaughrin (1996) it reflects the interactions between clients and provider attitudes and preferences about what constitutes acceptable personal and treatment practices. According to Bagheri and Benwell (2005) acceptability reflects people's views about health care services and how service providers interact with patients. Leisinger (2008) describe acceptability as the degree of fit between characteristics of the provider and those of client, while according to Wyszewianski (2002), acceptability reflects the extent to which the client is comfortable with the more immutable characteristics of the provider, and vice versa. McIntyre *et al.*(2009) define acceptability as the providers' and patients' attitudes towards one another's characteristics and expectations, and how these attitudes interact. According

to Ray and Ebener (2008) acceptability means the match between how responsive health services providers are to the social and cultural expectations of services users.

2.3. Operationalization of access dimensions

The complexity of access concept requires looking separately at its various components during the operationalization process. For policy-planning it is necessary to identify a number of indicators of access that would allow them to assess how access is attained or to determine whether particular health services delivery programs contribute to the improvement of access. Various access studies have considered a range of indicators regardless of the context of a particular country or region. For example relevant indicators for developed countries might differ from those which are relevant for third world countries such as Sub-Saharan region. For this reason, indicators used to measures access dimensions are generally described regardless of the country or region. This implies that the choice of indicators to measure access should be chosen with rationality in order to fit with the reality.

2.3.1. Operationalization of accessibility

As mentioned before geographical accessibility has acquired more attention compared to other dimensions of access. It is often measured in terms of travel impedance represented by travel time and distance between the location of health facilities or health providers and population residence.

2.3.1.1. Travel distance and travel time

Geographical distance has emerged as a predominant factor in the utilization of health care (Buor 2003). In a study conducted by Hutchinson *et al.* (1999) in Uganda, the authors revealed that the distance which individuals must travel to reach health care providers was among the main reasons for the population not to seek care. Many other studies have also insisted on the effect of distance on health facilities usage, most of which have focused on distance decay, showing that health services usage decreases with greater distances from the source of care.

Travel time estimates constitute another indicator of geographical which has also become commonplace in studies of access to health care services. Travel time is often associated with travel distances in the sense that greater distances generally correspond to more travel time and vice versa. The distance travelled to reach health care providers often serves as a proxy for travel used time. Hutchinson *et al.*(1999) state that travel time is an important metric of geographic access to health care and according to Haynes *et al* (2006), estimated travel times provide a reliable substitute for direct observations of actual travel effort, which would be difficult to obtain otherwise. Within many other studies such as Amer (2007), Jones *et al.*(2008) and Rutherford *et al.* (2009) estimated travel times have been used to measure access to different types of health facilities.

In the operationalization of accessibility, greater distances and longer travel times to health care to providers are considered as obstacles to the use of health services while shorter distances and shorter travel times are considered as favourable to the use of services. However, travel distance and time to reach health providers might be an obstacle or not while influenced by other factors such as the mode of transportation as explained below.

2.3.1.2. Mode of transportation

Transportation is another factor which affects health care accessibility. Inadequate, expensive or physically inaccessible transport is one of the biggest barriers that people experiencing disadvantage face in getting to essential services, such as health care. Forster (2009) states that access to efficient, affordable and safe transport in the developing world is limited and directly impacts the ability of individuals to seek timely health services. As noted by Eustace (2005), people who do not have access to private or public transportation are more likely to be those experiencing health disadvantages. As concluded by Perschon *et al.*(2008) from the evaluation of four health pilot projects conducted in Ghana, Senegal, South Africa and Uganda, travel time constitutes an issue in Sub-Saharan African countries where healthcare services are not widespread, the road network is in bad conditions, with unaffordable transport systems, lacking transport in emergency cases and great distances towards healthcare facilities. This implies that people who have to walk longer distances, obviously will face more challenges than thos who have other efficient means of transportation such as private car, motorbike, et.

2.3.1.3. Natural barriers

According to Perschon *et al.* (2008), natural factors such as topography can also influence ccessibility to health services.

Because of the spatial aspect, of geographical accessibility, Geo Information Science has played an important role in its measurement with the concern to improve its measurement, different methods have been developed.

2.3.2. Operationalization of availability

According to World Health Organization (2006), two types of information are generally used to measure availability: the size of the population and the quantity of resources available for delivering an care.
With regard to availability, resources include the type and number of health facilities, type of services, number of health workers, availability of technology, drugs, equipment, number of beds, etc. The availability is often measured by comparing the types of resources with the size of population, such as the number of patients seen per day, the average number of outpatient visits per year, average beds occupancy rate and the average number of inpatients admittances per year (World Health Organization 2006) and (Perschon *et al.* 2008) Wile measuring availability, the population is often disaggregated according to the administrative structure of the geographic entity concerned (World Health Organization 2006). In general, availability can be determined by spatial or non-spatial factors.

2.3.3. Operationalization of affordability

From different descriptions of affordability, this dimension is mainly determined by people's ability and willingness to pay for health services. Many studies have shown that ability of patients to pay for services also influences the use of services. The ability to pay is determined by different factors such as services costs, income and health insurance coverage.

2.3.3.1. Services cost

Through the literature, the costs of care have been subdivided into two types: Direct costs and indirect costs. *Direct costs* include the price of services at point of delivery and cover a range of items such as consultation fees, unofficial fees, diagnostic tests, medicine charges and pre-admission deposits I*ndirect costs* include transportation fees in case patients pay for transportation (McIntyre *et al.* 2009). The financial barrier of services cost has been recognized. For example Ensor and Cooper (2004) state that user fees can lead to delays in care seeking, reduction in attendance at facilities, particularly among the poor, and impoverishment of marginalized families. The same authors also claim that travel costs are often the second most expensive item after medicines, in outpatient treatment.

2.3.3.2. Income

With respect to income, research has proved that low and moderate-income families face greater financial constrains from both health costs and limited insurance coverage, increasing thus the burden of out-of-pocket costs for care which is often not afforded by many.

2.3.3.3. Insurance coverage

Insurance coverage has been documented in many health studies as a determinant of health care affordability. Some studies have revealed that medical expenses by the uninsured constitute an important burden for households. For instance, the study of Dubay *et al.*(2007) showed that uninsured patients use fewer services and face higher out-of-pocket spending than their insured counterparts in the United States. According to Hall *et al* (2008) there is a strong and convincing evidence that not having health insurance is a major deterrent to health care . Health related studies have also recognized the importance of health insurance in the context of developing countries. For example Soors *et al.*(2008) state that health insurance coverage improves financial access to health care by protecting households from health-expenditure related risks and ensures quick access at the time of need. Other research studies such as those conducted by Jutting (2001) in different sub-Saharan African countries namely, Senegal, Uganda, Côte d'Ivoire, Tanzania, Ghana, and Benin, have shown that the emerging community-based health insurance schemes in those countries insure a better financial access to health care to the members than non-members.

The willingness of the population to pay for services is also considered as a financial factor influencing access to health care when people can afford insurance or health services but refuse to purchase them (Didem *et al.* 2009).

2.3.4. Operationalization of accommodation

Within the dimension of accommodation, the factors recognized by the literature as influencing access to health care are appointment systems, the hours of operation, walk-in capability, the use of telephone services, waiting time to the facility and the cleanness of the health facility (Penchansky and Thomas 1981) and (McIntyre *et al.* 2009).

2.3.5. Operationalization of acceptability

Indicators of acceptability are described in access related literature as those characteristics of providers and patients along with their expectations, which influence the nature and outcomes of the interactions between providers and individuals (McIntyre *et al.* 2009).

2.3.5.1. Characteristics of providers and patients

The type of providers or of the patient, their age, gender, race or ethnicity, language, education level and culture have been recognized as influencing the use or outcomes of health services.

2.3.5.2. Expectations of providers and patients

Providers often expect that patients respect their professional status and comply with the prescribed treatment while patients expect certain attitudes from the providers such as kindness during treatment, respect of patients' privacy, listening to illness symptoms descriptions, undertaking a thorough examination, proper explanations of the diagnosis, discussion about treatment alternatives, etc (McIntyre *et al.* 2009).

2.4. Critical reflection on the definitions and operationalization of access dimensions

Thorough the previous sections, definitions of the five dimensions of access from various authors were explored. The substantial remark at this stage is that of similarities among various definitions for the five dimensions respectively. It is not surprising since most of the authors have borrowed the concept from the original framework proposed by Penchansky and Thomas (1981). The slight difference observed in the definitions are related to the taxonomies such as spatial or physical accessibility to relate to geographical accessibility, financial accessibility instead of affordability, adequacy instead of accommodation or cultural accessibility as a synonym of acceptability. The main difference exists though in the operationalization of the concepts where some determinants considered measure specific dimensions, are inherent to a particular context. For example within the dimension of accommodation the schedule of appointment by telephone communication is suitable for developed countries and not applicable for man Sub-Saharan African countries including Rwanda.

2.5. Objectivity and subjectivity in the measurement of access

The notion of subjective and objective indicators is commonplace in social research such as studies of social well being and quality of life (Ruggeri *et al.* 2001), (Georgiou 2009) and (Tesfazghi 2009). However this applies also for health care access related studies which are associated to a certain extent with the quality of life.

2.5.1. Objective measures of access

Objective indicators of access to health care are described as observable "factors" that facilitate or impede the opportunity to use health services and which can be subsumed under different dimensions of access. As stated by Thiede and McIntyre (2008), objective measures of access are concerned with various utilization rates which refer to observed behaviors or documented evidence of individuals' actual use of health services. Example of utilization rates are frequency or patterns of physicians' visits, frequency or types of services provided, etc. Objective measures also can refer to rates which may be measured in a variety of ways such as a simple proportion of those who did or did not have contact with a provider within a given period of time(Daniels 2001), (Lavastida 2000) (Crall 2006).

2.5.2. Subjective evaluation of access

The importance of subjective measures of access has also been highlighted in various literatures. Subjective measures have their basis on reports that people make about their feelings, attitudes and evaluations which would not be obtained otherwise. Andersen *et al.* (1983) describe subjective indicators of access as consumer evaluations of various aspects of their care-seeking experience, such as the convenience, cost, provider behavior, or overall quality of the care they receive. Likewise, Lochoro (2004) defined patient's satisfaction as an expression of the gap between the expected and perceived characteristics of health services. In the same respect, Donabedian (1972) affirmed that access must be evaluated not just by the presence of services, but by determining the utilization patterns as well as client satisfaction. According to Daniels (2001) subjective measures of access reflect the satisfaction with treatment and encompass patients' opinions, expectations, values and experiences about health services

The power of user's subjective evaluation of access relies on the fact that in healthcare, the ultimate user of the system is the patient. Thus, the patient survey has been recognized as the most appropriate method to measure outcomes of the system.

As elucidated by Mascarenhas (2001), patient's satisfaction is a useful measure that evaluates the quality of care, and provider to patient relationships. Similarly, Al-Mudaf *et al.*(2003) asserted that, a patient's opinion is an important quality indicator in measuring the outcome of any medical service and thus can assist health care providers in designing health management plans. The importance of satisfaction as means of subjective evaluation of access was also highlighted by Gochman (1997) who described patient satisfaction as an important evaluative yardstick in assessing the performance of the medical care system with respect to access.

Various literatures have proposed different ways of measuring patient's satisfaction. For example Lochoro (2004) proposes that satisfaction could be elicited by asking simply how satisfied or not patients may be about the service. Weaver *et al.*(1997) measured patients satisfaction by asking to patients to rate their evaluative responses about how they perceive care on a five points Likert scale offering poor, fair, good, very good and excellent as options. Satisfaction can be evaluated by patients specifically at a given facility or in terms of their particular experiences, or in general by the public with respect to their perceptions of the performance of the medical care system as a whole, higher satisfaction scores generally corresponding to a good attainment of access and vice versa.

Takemura *et al.*(2006) suggest the use of reliable and valid questionnaires as primary means of measuring patient's satisfaction in a medical setting and satisfaction questions can be asked about a particular aspect of access.

2.5.2.1. Satisfaction within the five dimensions of access

As stated by (Lochoro 2004) It is recommended that patients be asked to report on their experiences about different dimensions of access. With respect to geographical *accessibility* satisfaction can be assessed through specific questions such as those related to bus services; car parks, and travel time to reach the facility.

For the availability dimension, one method which is applicable to the measurement of quality of health care is the consumers' ratings of the services provided (Amponsah 2009). Related to availability, Lochoro (2004)

suggest that patients be asked questions to express their satisfaction about the range of services in relation to what they need.

Regarding *affordability*, satisfaction is concerned with individual or health system financial factors which ease health care utilization or lead to difficulties in seeking care, as explained in section2.3.3.

With respect to accommodation, measures of patient's satisfaction with health care can provide important assessment of quality of health care not adequately captured by other health service statistics such waiting times, and consultation times (Lochoro 2004). Within acceptability dimension, the same author suggested that satisfaction questions relate to the extent to which users are treated with dignity and respect in the provision of care, taking into consideration their individual and social needs, values and preferences. Lochoro (2004)

2.6. Alternative methods to measure access

As mentioned earlier, the five dimensions of access can be described using a variety factors with different nature; hence the need for specific approaches, suitable for measuring access indicators of different types.

2.6.1. Geo Information Science and access measurement

With the rise of a particular branch of the technology for spatial data, namely Geographic Information System (GIS), along with its related spatial analysis methods, there are possibilities to analyze and describe spatial aspects of access to health care (McLafferty 2007) and (Luo 2004). In this regard, GIS plays a substantial role in the measurement of two dimensions with spatial major components namely geographical accessibility and availability, while other methods such as statistics methods are used to measure the range of non-spatial factors.

2.6.1.1. GIS and geographical accessibility measurement

The suitability of GIS in the analysis of accessibility has been recognized within a variety of literature, through an extensive attention dedicated to this dimension especially during the past two decades. Among many studies which were devoted to the use of GIS for accessibility analysis we can recall (Luo and Wang 2003), (Bagheri *et al.* 2005), (Ebener et al. 2005), (Amer 2007) and (McLafferty 2007). Among the common measures of geographical accessibility we can recall the computation of travel distance to the nearest provider, average distance to a set of providers and gravitational models found in (El-Genedy and Levinson 2006), (Connor *et al.* 1994), (Cromley and McLafferty 2003) and (Amer 2007).

In a study conducted by Haynes *et al* (2006) GIS was used to find the shortest travel time from each population location to each health facility along the road network and this approach was used in spatial analysis of accessibility within this study.

2.6.1.2. GIS and availability measurement

The most common measure of spatial availability is known as provider to population ratio (Wang and Luo 2005). With this regard, Fortney (2000) used the number of health providers in the area of residence divided by the population of the county. Luo (2004) used GIS to measure the number of physicians within different

travel time thresholds. The recent GIS - based method used to measure spatial availability is the Two Step Floating catchment Area method. As stated by Luo (2004), this method is useful in the evaluation of the match between providers (supply) versus demand (population). The major elements used in this method are the location of health care services and the population, as well as the number of services and size of the population at each location.

2.6.2. Alternative methods for measuring non spatial aspects of access

While GIS measures have been commonly used to measure spatial aspects of access dimensions, statistical methods have been commonly applied by many researchers to evaluate both spatial and non-spatial factors as described earlier. For example, Penchansky and Thomas (1981) have applied regression analysis and factor analysis to evaluate the satisfaction with five dimensions of access during a study conducted in Rochester, New York. Amponsah (2009) has applied factor analysis to evaluate the determinants of patients satisfaction with different dimensions of access in three Ghanaian Districts (Lawra, Dangme West and Ejisu-Juaben), while Wang and Luo (2005) applied the same methods to assess both spatial and non spatial determinants of access in Illinois. Alaiban (1999) used different regression methods to assess the relationships between patients' characteristics and level of satisfaction with different aspects of access to care in a health study carried out in Riyadh, Saudi Arabia.

2.7. Framework of evaluating access

The review of major works and leading theories in the field of access studies has led to the choice of the framework of access proposed by Penchansky and Thomas (1981) as the basis for this research. While analysing the concept of access to primary health care, it appears that generally access starts when a person is in need of services. After realizing the needs for health services, people seek them out and receive care, advice, or therapy, after then the outcome is measured. Understanding how and when process of seeking and using care starts and ends can shed some light on how well access frameworks can be applied in real-world policymaking or management.

In summary, it is suggested by many researchers that the process of studying access to health care should be undertaken taking into consideration the following elements:

(1) Health policy
(2) Characteristics of the health delivery system,
(3) Characteristics of the population
(4) Utilization of health services, and
(5) Consumer satisfaction

From this concept, in accordance with various dimensions of access, it is possible to create indicators of access that focus on both use and outcomes. The use indicators are "usual" objective measures such as having a "regular source of care"; the travel time to care; ability to get an appointment in a reasonable time; and in office waiting time.

Similarly to the previous description, the Figure 2-1 depicts various stages of the framework of access as summarized by Obrist *et al.* (2007). Once the needs for health services are identified, health seeking process begins, influenced by the five dimensions namely, Availability, Accessibility, Affordability, Adequacy, and Acceptability. The degree of access attained depends on the influence of health care services, health policies, institutions, organizations, processes that govern the services, and the livelihood assets people can mobilize

in particular vulnerability contexts. In order to reach positive outcomes, represented by patient's satisfaction, health status or equity, the utilization of health care has to be combined with high quality of care.

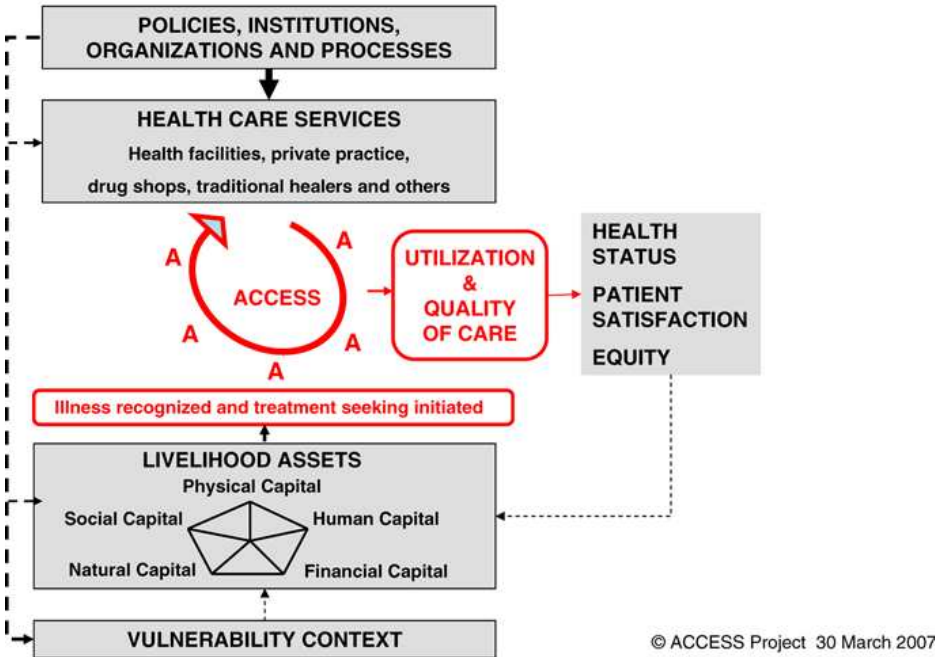


Figure 2-1 Access framework
Source: (Obrist *et al.* 2007)

2.8. Concluding remarks

Roy Penchansky proposed an approach to understanding access that focuses on the concept of "fit" between patient's needs and the system's ability to meet those needs through the use of services and outcomes. The fit can be measured across 5 dimensions: (1) *availability* which is the volume of physician and other health care services; (2) *accessibility*, the spatial or geographic relationship between the providers of health care and the users of care; (3) *accommodation* as the organization and content of the healthcare system as it relates to the ease with which people can use care (clinic hours, waiting time, and length of waiting time for an appointment); (4) *affordability* as the financial ability of the population to use the care provided by the system and the perception of value on the part of patients; and (5) *acceptability*, which represents the attitudes of the users of health care toward the providers, and vice versa. Subsequently this approach has proved its strength in the conduct of various empirical studies related to access. The next chapter deals with the description of the city of Kigali, used as the study area.

3. Study area description

3.1. Background

Located in the central part of the country (figure 3-1), Kigali is not only the capital city, but also largest city of Rwanda. It is one of the five provinces of the country (currently, the province is the largest national administrative unit). Kigali was created in 1907 as a small colonial outpost and it has been the economic, cultural, and transport hub of Rwanda since it became capital at national independence in 1962. The location of Kigali allows a connection with the rest of the country, via the road network, which makes the city the most important economic place of the Nation.

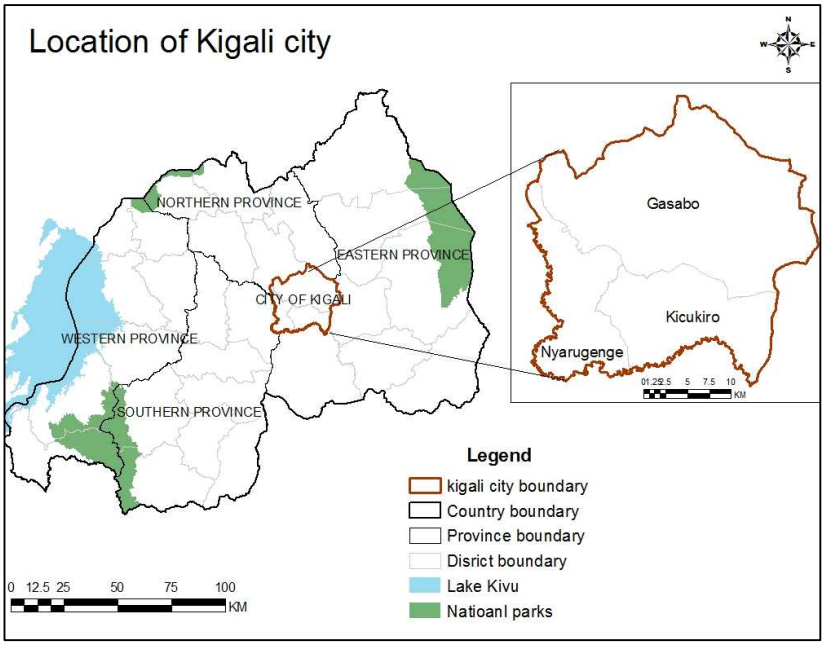


Figure 3-1 Location of Kigali city
Source: Rwanda National Institute of Statistics dataset

3.2. Physical characteristics

Kigali city is situated between 1° 52'43" and 2° 04'19" South latitudes and 29°58'55" and 30°11'02" East longitudes. The city is built on a hilly landscape, sprawling across about four ridges, separated from each other by large valleys in between. The elevation of lower parts is roughly 1400 m and the higher hills are at over 1845 m above sea level. The highest point is Mount Kigali, with 1850m of altitude.Over time, the habitat of the city of Kigali has evolved by leaps from one hilltop to another. This discontinuity is due to various constraints, namely the existence of flood plains, swamps and steep slopes. The settlements were mostly developed on gently sloping hillsides and on flattened hilltops. The hilly site of Kigali has been described by (Rousseil and Pau 1990) as analogous to those of Nairobi in Kenya and Kampala in Uganda. The city of Kigali is also situated near the confluence of two major rivers in the county, namely Nyabarongo and Nyabugogo.

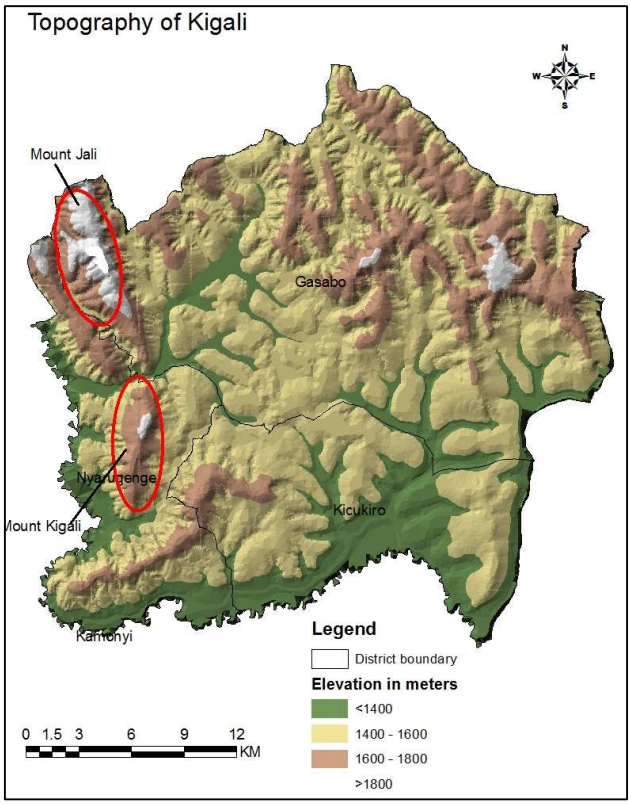


Figure 3-2 Topography of Kigali
Source: Rwanda National Institute of Statistics dataset

3.3. Administrative units

Currently, the City of Kigali is subdivided into three (3) administrative districts namely Gasabo, Nyarugenge and Kicukiro. The districts comprise 35 administrative sectors in total, which in turn are subdivided into 161 cells (figure 3-3). The cells also comprise a total number of 1061 Imidugudu, literally villages. However there is no spatially referenced data available for villages which explain their absence on different spatial visualizations in the present report.

Kigali has been subject to three major revisions of administrative boundaries. The first one occurred with decree-law no 11/97 of 20/04/1979 from which the defined area was 112 km^2. This was modified by the presidential order no 896/90 of 27/11/1990, to include an additional area of about 237 km^2, which conferred to the city a total area of approximately 349 km2. This area persisted even with the third revision based on the Law n° 47/2000 du 19/12/2000 redetermining the administrative entities. The latest changes in terms of area occurred with the fourth and latest revision, based on the law Nº 29/2005 of 31/12/2005 after which Kigali city total area was determined to be 730 till now (The Republic Of Rwanda 2005).

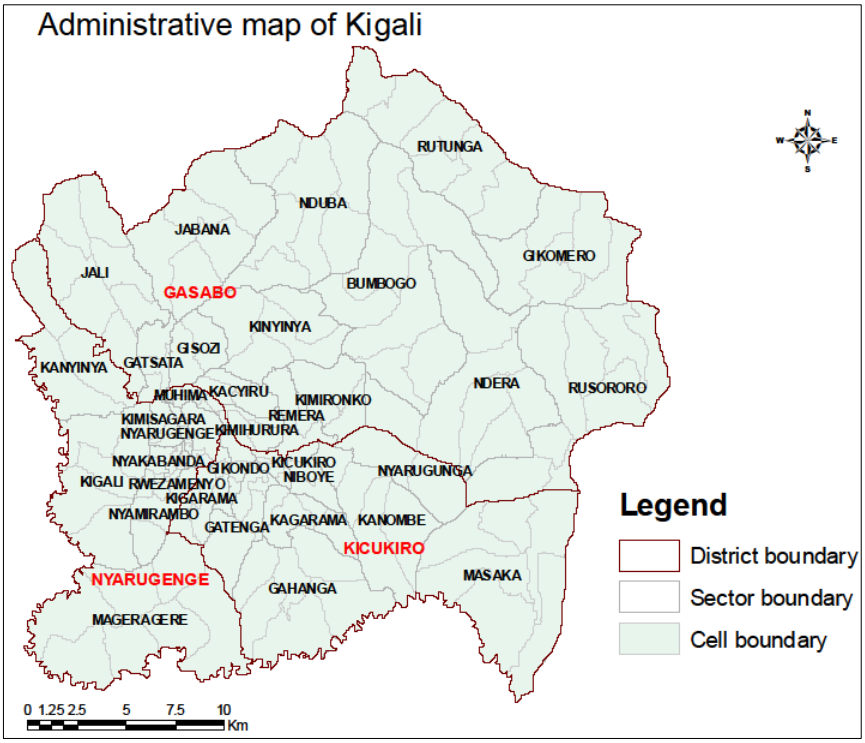
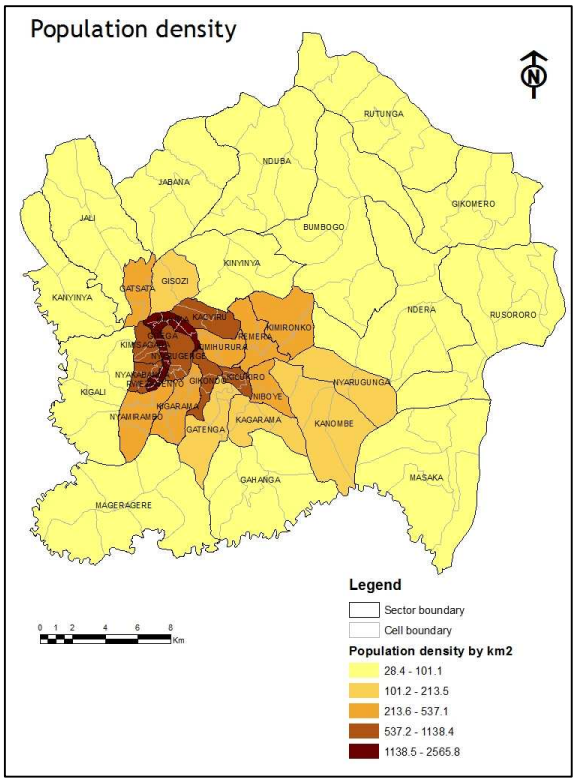


Figure 3-3 Administrative map of Kigali city
Source: Rwanda National Institute of Statistics dataset

3.4. Spatial expansion and demographic characteristics

With a population estimated to approximately 1 million inhabitants, sharing only 730 square kilometres of land, Kigali City is one of the fastest growing cities in Africa. Its population has more than tripled since 2000. The growth of Kigali during the colonial period was very slow, extended on a small area on Nyarugenge hill. After the independence, in 1962, with the relocation of different activities to Kigali, the city started to expand to neighboring hills such as Nyamirambo, Gikondo, Kimihurura and Kacyiru. A remarkable growth bound occurred after the genocide of 1994 when over 800000 people returned in Rwanda from exile in neighboring countries namely Uganda, Democratic Republic of Congo, Burundi, Tanzania, and Kenya as well as from overseas. Most of them have chosen to settle in the capital city for employment purposes or security reasons, contributing to a demographic explosion and a spatial extension of the city. This has been accompanied by an mass rural – urban migration with many Rwandans in quest of employment and better standards of living, resulting in drastic increase of population in Kigali. Women constitute 52.2% of the population resident in the city compared to a proportion of 47.9% of men. The young population makes up about 60% of the inhabitants. The actual city population annual growth is estimated to be 10% and is believed to increase if the city continues to be subject to above mentioned demographic dynamics.



Year	Population	Area
1907	357	8ha
1945	6,000	200ha
1960	6,000	250ha
1978	117,749	
1991	235,664	112km2
1994	350000	112km2
2000	605,000	349 km2
2005	851024	348km2
2006	930000	730km2
2009	1,000,000	730km2

Table 3-1 Population evolution in Kigali

Figure 3-4 Population density in Kigali city
Source: Rwanda National Institute of Statistics dataset

3.5. Land use

Currently, only 13% of Kigali total area is occupied by urban land use, while the remaining part (>80%) is rural. This is the result of the recent revision of administrative boundaries which conferred to the city an extended additional rural area. Within the urbanized area, the total planned area is about 30 % while the unplanned area occupies about almost 70 %. The urbanized area in Kigali has witnessed a high level of new settlements and economic activity since 1994. Similarly to the rapid population growth, the number of industrial and business establishments has increased significantly along the Gikondo valley, which was previously a wetland area. This increase has also added pressure on infrastructure so that presently, administrative authorities of Kigali claim that there is a need to develop proportionate infrastructure such as roads, schools and health facilities- to fit the number of the population

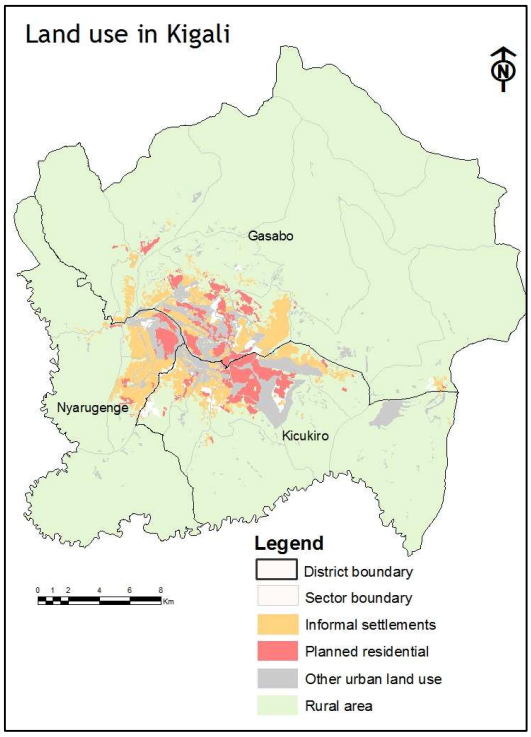


Figure 3-5 Land use in Kigali city

Land use	Area (in ha)
Forests	7241.5
Cemeteries	135.4
Landfill	24.6
Airport coverage/area	10290
Military zones	838.68
Religious centers	72.6
Health facilities	37.6
Education facilities	249.4
Green space	163.7
Swampy area	5506.2
Developed area	13
National police zone	47
Telecommunications	98.5
Administrative area	307.5
Commercial area	129.3
Industrial area	280.8
Residential area	4777.4
Sports centres	32.9
Area of Kigali City	4653.92

Table 3-2 Land use types in Kigali

3.6. Health care facilities

In Kigali, there are 5 health hospitals namely, King *Faisal* hospital, Muhima Hospital**,** University Central Hospital of Kigali (CHUK), Kanombe Military Hospital and Kibagabaga hospital The 25 public health centers distributed in all parts of the city with a high concentration in the urbanized area and they mostly borrow the names of sectors or cells within which they are located.

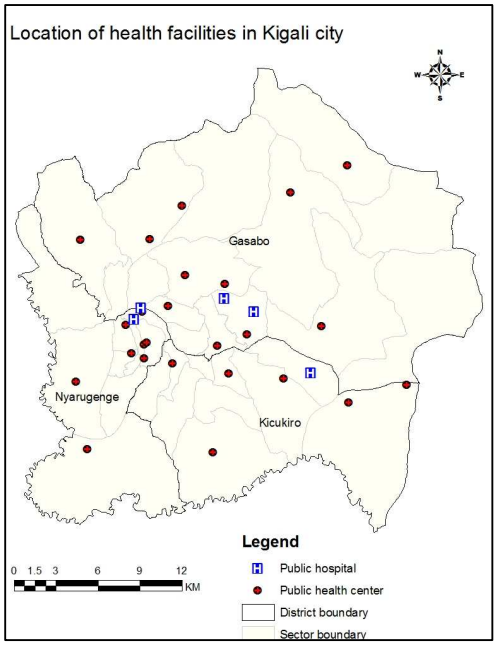


Figure 3-6 Location of public health facilities

3.7. Health care organization and management in Rwanda

Health services in Rwanda are provided through the public sector, Government-assisted health facilities run by various religious groups or nonprofits associations, private health facilities, and traditional medicine. 90% of the health care facilities are run by the public sector and non-profit organizations; the remaining proportion is private owned and for-profit (National Institute of Statistics 2008). The following sections describe the package of health care provided in pubic facilities.

3.7.1. Health care package

Nationwide, the health care delivery system is comprised of the three main packages:

Preventive services such as premarital consultation, maternal and child care, family planning services, and epidemiologic surveillance activities.

Curative services, comprising consultations, management of chronic illness, nutritional rehabilitation, observation before hospitalization, normal deliveries, minor surgical interventions, and laboratory testing.

Promotional health services related to information, health education and communication, psychosocial support; nutritional activities related to small farming and food preparation, hygiene and sanitation (Rwanda National Institute of Statistics 2008).

3.7.2. Health care management

The current management of health services is based on decentralization, which started from the province and ultimately to the district level and currently to sector level (Rwanda National Institute of Statistics 2008).

Sector-level: a health sector comprises roughly 50,000 people. Each sector must have at least one health center for primary care.

District-level: A Health district is comprised of multiple sectors (usually about 5), with roughly 250,000-500,000 people in each District. (There are 30 Health Districts in Rwanda, which now have about 10 million people total). Each District has at least one hospital providing secondary care

National level: this is the level providing tertiary care and it is made up by teaching hospitals.

3.8. Rwanda National Health policy

Primary health care is currently the focus health care policy. The policy oriented goals for health sector planning are targeting the delivery of primary health care to insure the reduction of child mortality, improvement of maternal health, fighting against HIV/AIDS and other diseases, and to reduce malnutrition in relation to the Millennium Development Goals. The main objective is to maximize access of primary health care services for the entire population through the strengthening of institutional capacity, increase in the quantity and quality of human resources, improvement of geographical accessibility, improvement of the availability and affordability of drugs along with the improvement of the quality of services in the control of diseases (The Republic of Rwanda 2007). Within policy context, the next sections describe some actions undertaken to achieve the fixed goals related to health care provision.

3.8.1. Health care financing

The main source of health sector financing is the Government budget, which is allocated for the Ministry of the Health through the Ministry of Finances and Economic Planning, the assistance from bilateral/multilateral international partners or nongovernmental partners of the Ministry of Health and contributions from the population through prepayment programs or out-of-pocket. The percentage of the national budget designated for the public health budget was 4.7 % in 2006 (National Institute of Statistics 2008).This figure is much lower than the minimum (8 percent) recommended by the World Health Organization. It is estimated that to provide public health care of minimally acceptable quality in a developing country, a minimum budget of US$45 per capita per year must be allocated, which is more than three times the current Rwandan expenditure per capita for health (Rusa and Fritsche 2007). The following paragraph explains the Community Based Health Insurance Schemes as a solution for the financial access of care.

Community Based Health Insurance schemes (CBHI)

The Rwandan health care system fully subsidizes preventive health services for the entire population. But curative services (primary, secondary, and tertiary care) are not fully subsidized by the government. Insurance for curative care exists in the formal sector for civil servants, military, and by private health funds. However, over 50% of the population are employed outside the formal sector, and this leaves them financially vulnerable.

To make curative services affordable, to increase utilization, and to ensure sustainability of financing for these services within the informal sector, Rwanda has implemented Community Based Health Insurance (CBHI) schemes known as *mutuelles de santé, to* raise revenues for curative health services. CBHI are community-based health organizations that offer voluntary, non-profit health insurance schemes for the informal sector. They are formed on the basis of mutual aid and the collective pooling of risks at the local sector level for primary care, with larger pools at the district level for secondary care, and the national level for tertiary care.

Approximately 50 percent of CBHI funding is comprised of annual member premiums. Households pay annual premiums, which is the equivalent of almost $1.81 per person, per year. Donors and government programs support CBHI by paying fees for those that cannot afford any level of coverage. The remaining half of CBHI funding is obtained via transfers from other insurance funds, charitable organizations, NGOs, development partners, and the Government. CBHI does not cover care at private health facilities.

The funding of CBHI is allocated in the following way:
From the Ministry health annual budget: 13%
From the annual contributions of Civil Servant's social insurance: 12%
From the annual contributions of the Military Medical insurance: 12%
From the annual contributions of the Genocide victim's fund: 12%
From the annual contributions of private's health insurance: 1%
From development Partners: <1%
From local government: < 1%
Source: (Kayonga 2007)

3.9. Standards of spatial accessibility and availability

Health care facilities are considered as geographically accessible to the population if they are reachable by foot in one and a half hours. Geographic distance and mountainous terrain, however, continue to constrain access to health care. In respect to spatial availability, the norms include an average coverage of 20,000 people per health center (National Institute of Statistics 2008).

3.10. Standards of human resources for health centers

Rwanda, like many other developing nations, faces major health care human resources constraints. The norms for health centers coverage estimate 20000 inhabitants for one health center and 200000 inhabitants for one the hospital, Taking into account population density, geographical accessibility and the configuration of existing structures.

Minimum education requirements	**service position**	**Required Number**
A1*	Head of health center	1
A2*	Consultations, family planning and medical education	1
A3*	Midwife in charge of premarital, post-natal consultations and deliveries	1
A3*	Nutritionist in charge of growth monitoring and rehabilitation	1
-	Laboratory assistant	1
-	Minor surgery	1
-	Immunization	1
-	Auxiliary aid health nutritionist	1
-	Auxiliary health lab assistance	1
-	Management and distribution of drugs	1
-	head cashier / account ant (secondary ably accounting)	1
-	cashier (Worker who can read, write and count)	1
-	worker responsible for promotional activities	1
-	workers responsible for cleaning and sterilization	2
-	watchmen	2

Table 3-3 Standards OF Human resources in health centers

A1 level corresponds to the degree earned after completion of 3 years post secondary studies.
A2 level is attained after completing 6 years in secondary studies.
A3 level is attained after completion of 4 years secondary studies.

4. Research methodology

The methodology of the research is subdivided in two major parts: data collection and data analysis.

4.1. Data collection

The process of data collection which took place in first instance was divided in two phases: data collection preparation and actual data collection.

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4.1.1. Preparation of field data collection

This phase was concerned with the sampling design and the elaboration of questionnaires for data collection. Sampling is an necessary aspect of every social research (Gerrish and Lacey 2006). It refers to the researcher's process of selecting the sample from a population in order to obtain information regarding a phenomenon in a way that represents the population of interest (Brink and Van der Walt 2005). In this research, sampling includes health centers, patients and medical personnel

4.1.1.1. Sampling design

Sampling was concerned with the health centers where informations should be collected and the study population composed by patients

Sampling strategy of health centers

In the present study, health facilities play a major role in data collection because the focus is on access to health care. The sample of health facilities was drawn from a list of 33 public health care facilities available in the whole city of Kigali, comprising 9 hospitals and 21 health centers. Since the research is specifically concerned by access *to primary health care,* hospitals were eliminated from the list because they provide an advanced level of care which is not the object of the study. Thus the final sample was drawn from the remaining 21 public health centers because they represent the first level of care otherwise called primary care towards which the current research is oriented**.**

After the elimination of hospitals from the sampling frame, a sample of seven health centers was first randomly drawn from the list of 21 public health centers, taking into account the levels of urbanization where the health centers are located. Four health centers were first selected in the urbanized area (Kabuye, Kicukiro Muhima and Kibagabaga) and 3 health centers were selected in the non urbanized area (Butamwa, Gikomero and Kabuga).

However, due to the incapability to obtain the permission to collect data from the following health centers : Kibagabaga, Kabuga and Kicukiro, these three health centers were abandoned and replaced by health centers from which it was easy to obtain the permission to collect data. Those newly selected healt centers are Kinyinya, Busanza and Kagugu health centers all located in non urbanized area. At the end, only two selected health centers are located in urbanized area while the remaining five are located in non-urbanized area.

The assumption behind selecting health centers from two different areas in terms of urbanization was that there might be spatial variations in terms of access based on different characteristic of those areas such as ease or difficulties in transportation and population characteristics.

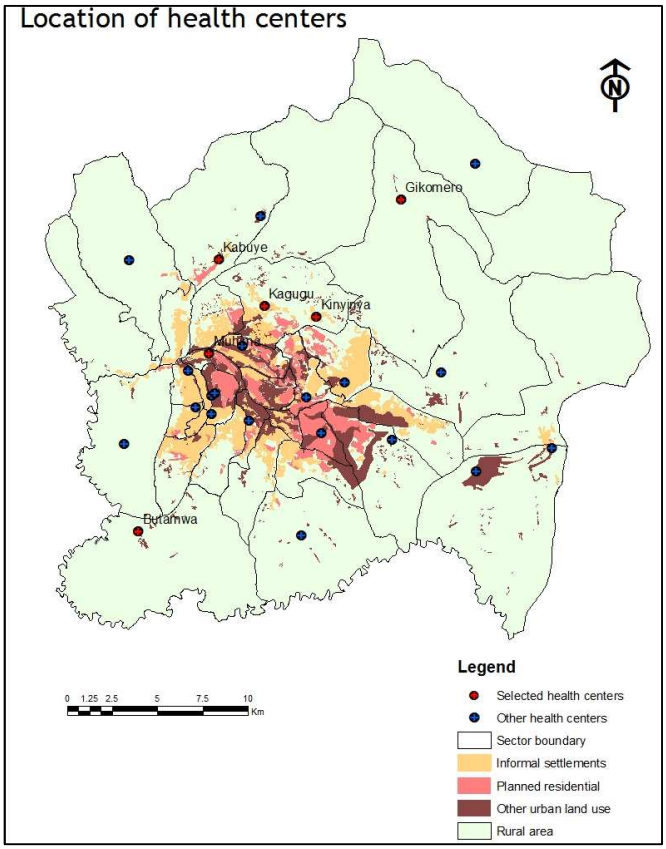

Figure 4-1 Location of sample health centers

Patients and medical staff sampling

The sampling method used is the non probability sampling method. During this phase, a combination of two types of non probability sampling methods was used. The first method is the purposive sampling in which the sample selection considers the appropriate population category for the type of study and the second is the convenience sampling in which members of the population were chosen based on their relative ease of access.

Purposive Sampling: this method was applied for the choice the population category. The type of population chosen was composed by patients who constitute the larger focus group for data collection and a limited number of staff members' at selected health centers.

Convenience sampling: This method was used to choose the specific type of patients and staff members as study population and the appropriate place for interviews. The convenience sampling method is referred to by Brink and Van der Walt (2005) as a method which involves the choice of readily available subjects or objects of the study, because they happen to be in the right place at the right moment.
During data collection there was no list available from which a sample of patients could be drawn. With regard to this problem, Gerrish and Lacey (2006) suggest when it is not possible to obtain a comprehensive list of the population to be studied, the solution is to use convenient sampling schemes. Thus, the most convenient category of patients chosen was outpatients. These are patients who need ambulatory care and are

not overnight hospitalized in the health care facility. They were chosen as main focus group because they were considered to be the most easily accessible fraction of the population who use primary health services.

Because the sampling frame was unknown, a sample of 315 outpatients was fixed for interviews, 45 patients were selected at each health center.

The same convenient sampling method was used to choose Medical staff members in charge of different types of health services to the selected health centers. Medical personnel were not the main target group of this research; hence, only a limited number of them were required. Therefore, at each selected health facility, the chosen medical staff members are staff in charge of different services available in health centers, considering 1 person in each service.

In addition to heads of services, one staff member in charge of administration was requested to each health facility for secondary data collection that could not be obtained otherwise**.**

4.1.1.2. Elaboration of patient's questionnaire

The questionnaire is the main instrument which was used during interviews. The design of patients and medical staff questionnaire was the same, because the purpose was at the end to crosscheck their answers in order to validate patients' answers to cope with possible biasness that would result from subjective answers if only one group had to be interviewed

The questionnaire was composed by two types of questions: the first type comprised open-ended questions for which respondents could freely give their answers without leading them and the second type comprised close-ended questions. This second type was composed by a set of dichotomous questions which required yes or no answers and a set of questions requiring the choice of the right answer from a list of several possible options. Regarding the subjective aspect, (satisfaction with services), satisfaction questions was arranged on a 3 points Likert scale, ranging from satisfied to dissatisfied with the aim to measure the levels of satisfaction with different components of access to health services. The two types of questions were mixes throughout the questionnaire and the higher proportion is for close-ended questions.

Both types of questionnaires (for patients and medical staff) are divided in six parts; the first part is related to general informations of the respondent and the next five blocks address specific questions related to aforementioned dimensions of access to health care.

The first general part addresses general socio-economic and demographic characteristics of the patients namely gender, age, marital status, education level, job and monthly income. The aim of those questions was to record how socio economic and demographic factors influence access to health care**.**

The second part comprised questions which were related to the dimension of *geographical accessibility* to health care. In this part, questions aimed to recode patients' travel time and distances estimates, the type of transportation system used to reach the health center as well as their perceptions (satisfaction or dissatisfaction) about their geographical accessibility to the health center.

The third part was related to the dimension of *availability* of services in the health center. The concern in this part was to analyze the extent to which patient are satisfied or dissatisfied with the type of services that they

received. The aim was to know if they received the quality of care they needed, and if not, to analyze the reasons why they did not**.**

The fourth part was related to the dimension of *affordability. It was* composed by a set of questions related to the type of health insurance used and the price of medical care. Subjective questions were also included related to their satisfaction with services costs and health insurance.

The fifth part was composed by questions related to the dimension of *accommodation* of health centers, which is represented by the organization of the health care. The aim of questions in this section to record opening days per week and operating hours per day of the health center, the amount of time that patients spent waiting for services and patients levels satisfaction with operating hours and the time they spend waiting for services such as consultation and laboratory results.

Finally, the sixth part comprised questions related to the dimension of *acceptability* of health centers, represented by relationships between medical personnel and patients. This part comprised only subjective question about how patients perceive medical staff level of courtesy, the provision of information regarding services and the time medical staff spent listening to patients.

Apart from the questions related to the dimensions of access to health care, additional questions are included at the end of the questionnaires to record patients overall satisfaction level with the services provided by the centre and the suggestions that should be considered by health sector planners to improve health care services.

4.1.1.3. Elaboration of medical staff questionnaire

The elaboration of medical staff questionnaire followed the same design as that of patient's questionnaire, based five dimensions. About geographical accessibility, medical staff was asked if travel time, distance and transportation constitute a problem to some patients. For *availability*, medical staff was asked if their service has enough skilled personnel to satisfy the demand and if they have all the equipment required in their service. With regard to *affordability*, they were asked if the services covered by health insurance satisfies the needs of patients, if the patients face problems with the contribution of insurance and other fees related to health services. In relation to *accommodation*, medical staff was asked the number of days per week and hours per day that their service is open, the average amount of time that a patient has to wait to get services or to get results in the case of laboratory. They were also asked if sometimes patients have to wait for long and if yes why, if it is possible to serve all patients who are present every day and what they feel about their own work load.

Related to acceptability they were asked about the amount of time they spend with one patient, if patients understand well the explanation about the treatment and if patients are willing to discuss with them about their health problems. They were also asked how often they have refresher courses on medical ethics.

4.2. Actual data collection

The collected data is of two types: primary data and secondary data. The following sections illustrate how the process of collecting these two types of data was carried out.

4.2.1. Primary data collection

Primary data collection was carried out through Interviewed with patients and medical staff using the designed questionnaire as explained in previous sections. Interviewed patients were those who attended the health center the day of interviews, after they received medical services. This strategy was used because it was considered to be cheap for data collection in terms of financial resources and time. The sample of 315 was fulfilled as planned.

Based on their availability, 38 health centers staff members in charge of different services were interviewed and they are distributed as follows: 6 at Busanza health center, 5 at Butamwa health center, 10 at Gikomero health center, 7 at Kabuye health center, 7 at Kinyinya health center and 3 at Muhima health center**.**

4.2.2. Secondary data collection

Secondary data related to health as presented in table 4-2, was collected from health centers, those data are the total number of the population served by the health center, patients attendance rates, origins of patients attending the health centers, health status figures of patients, availability of human resources in the health center (number and education levels of staff members), types of services offered by the health center, opening days per week or operating hours per day, number of hospital beds, availability of laboratories and pharmacies, and the types of insurances accepted by the health centers.

The second set of complementary data is composed by spatial data needed for spatial analysis of access. They were collected from the Center for Geographic Information System and Remote Sensing of the National University of Rwanda and they are summarized in the table below.

Data set	Data source	Date of creation	Description
Ortho-photos	Rwanda National Land Center	2008	Geo referenced aerial photos covering the city of Kigali Spatial resolution 25cm
Digital elevation Model (DEM)	Shuttle Radar Topography Mission (SRTM)		DEM covering the whole country (Rwanda) Spatial resolution : 25 m
Province boundary	MINITRACO-CGIS/NUR, MINECOFIN/SNR	2001 2006	Former boundaries of administrative provinces Revised boundaries of administrative provinces
District boundaries	MINITRACO-CGIS/NUR, 2001 MINECOFIN/SNR 2006	2001 2006	Former boundaries of administrative districts Revised boundaries of administrative districts
Sectors boundaries	MINITRACO-CGIS/NUR, 2001 MINECOFIN/SNR 2006	2001 2006	Former boundaries of administrative sectors Revised boundaries of administrative sectors with population of 2006
Cell boundaries	NISR	2006	Revised boundaries of administrative cells
Road network			Polylines categorized in hierarchical categories from 1 to 5
Health care facilities	Ministry of health		Locational points of public Hospitals, public health centers and private clinics.

Table 4-1Spatial data set used in spatial analysis

4.3. Data analysis

4.3.1. Description of individual variables used to measure access dimensions

The analysis of individual objective and subjective indicators developed under different dimensions was done using descriptive statistics such as percentages, means, and standards deviations, minimum and maximum. For geographical accessibility, availability, affordability and accommodation, objective and subjective indicators were combined. For acceptability, only subjective indicators were used as the perception of patients about attitudes of providers. For all dimensions subjective answers were recorded on a three point Likert scale ranging from satisfied to dissatisfied. For geographical accessibility travel time and distance from health centers and cells centroids were computed using GIS spatial analyst and network analyst as explained in the following lines.

Spatial analysis of travel distance and travel time

As described in the literature review section, GIS is a strong tool for the analysis of access to health care, especially for the analysis accessibility and availability dimensions. In this study it has been used for the spatial evaluation of accessibility based on travel distance and travel time from population locations to different health facilities in Kigali. The following paragraphs describe spatial analysis process.

Estimation of population origins and destinations

The spatial analysis of geographical accessibility (mainly travel distance and travel time) requires the consideration of health services users' origins and their destinations for the assessment of their spatial interactions. Due to the lack of precise information such as geo referenced origin points, population origins were assumed to be the centroids of administrative cells where they live. Destinations are health centers and their geographic coordinates are available. In addition, knowing where people come from and the location of health centers allow the comparison of potential access based on secondary information and the reported access from empirical data. This can for example provide the insight on behavioral choice of health centers by assessing if people visit the nearest health center or not.

Travel time analysis

The road network plays an important role in the analysis of travel time because it serves as the communication link between population location (origins) and their destinations (health centers). For this reason road network based analysis was chosen among other procedures. The other reaon to opt for road network based analysis was because of its potential to provide more accurate estimates of distance and travel time than Euclidean measures. The main processes during road network analysis are below described:

Creation the road network dataset and topology check

Prior to network dataset creation the topological consistency of the road network was checked and inconsistent road segments were removed. In this case, isolated lines were checked using Axwoman 4.0, a space syntax based extension of ArcGIS developed mainly for urban morphological analysis. The found isolated lines were corrected using ArcGIS 9.3.1 editor tool, because they could hamper subsequent analyses and sing the same tool some unconnected segments was also connected. All road types available in the area were maintained assuming that all types of roads can be used for walking mode. After topology check, ArcGIS 9.3.1 Network Analyst tools were used to create a road network dataset. Before building this network dataset, attributes were added for travel time in each direction along a road segment. To calculate these times,

only the segment length and walking speed limit were considered since people were assumed to walk continuously without stopping on their way.

Estimation of transport modes and walking speed along the road network

Travel time estimations along the road network can be done for different transport routes and different transportation modes. However in our case walking mode is the most dominant and thus was the only mode considered while computing population travel time and distance to health centers.

Average walking speed was required in order to compute the time that an individual has to travel along a given road segment length, thus the process of computing travel times along the network used also information about road length. As mentioned earlier only walking mode was considered, based on the fact that population majority in the area visit health centers on foot. The walking speed used in accessibility literature varies between 3 and 5km/ hour in line with various circumstances. In Kigali, the estimated 3 km/hour speed was considered assuming that people walk much more slowly on a hilly landscape.

Land use digitization

Rural and urban land uses in Kigali were digitized using ortho photos as presented in the spatial data set table 4-2. Within the urban area, planned residential, informal settlements and other urban land use types were also differentiated. The purpose of digitizing these land use types was to later allow to analysis and evaluation of accessibility based on different land use types.

Analysis of travel distance

Walking distances in the area were computed using Euclidian distances functionality from ArcGIS spatial analyst and based on the raad network. The measured distances were from the location of health center towards administrative cells. Euclidian measures were opted for because its simplicity in the analysis. However, Euclidian distances or straight line distance present major weaknesses such as that of failing to take into account any barrier to movement or transportation routes.

Travel time computation along the road network

After the process of organizing required informations related to the road network, the following formula was used to compute travel time: ([shape length]/[speed])/1000*3600. Note 1000 used as the map units were in meters. One visualization problem of network based accessibility analysis was that the areas where the road network is missing are translated as having 0 values and thus appear to the map similar to those with short travel time, and this may misleads the interpretation of the results. This can be overcome by displaying the cells without road network as unclassified or excluding areas without road network prior to actual analysis.

Population estimation

The inclusion of population data in accessibility analysis is useful for planners since it can give the insight about who is served and who is not. In order to evaluate the number of served and unserved population in the area, the size of the population was calculated for each travel time and distances thresholds. However prior to computation some steps were performed in order to obtain useful population related information. Those steps are described below:

Subdivision of the study area into smaller geographic units

As described in previous sections, Kigali has three different types of administrative units: 3 districts, 31 sectors and 161 cells. However due to numerous revisions of administrative boundaries occurred over recent years, without any associated population census, there is a lack of precise data related to the population for the smallest administrative unit which is the cell, thus, the smallest administrative unit for which population

data is available is the sector. However, the spatial extent of an administrative sector is too large to allow accurate population data based analysis. For example the average size of the sector in the study area is 20 km^2 with number of large sectors which can reach 60 km^2 of total area. In order to ensure more accuracy of population based analysis of accessibility, Flowmap program were used to create, hexagonal tessellation subdividing the study area into smaller uniform geographic units. In total 4722 hexagons were created covering the whole city of Kigali. Each hexagon has an edge to edge diameter of 250 meters and covers an area of nearly 16 hectares. Spatial analysis was limited to sector and cell informations, administrative districts were not included in the analysis. The figures below shows two major administrative units used in the analysis (sector and cells) and the hexagonal tessellations above described.

Disaggregation of population information to cell level

As explained before the sector level was not appropriate for an accurate analysis of accessibility. The following lines describe the steps followed in the disaggregation of the population to a smaller level of analysis. Using ArcGIS, intersect tool, population information contained in sectors layer were disaggregated to cell level and both sectors and cells information were combined in the same table. Due to the lack of precise information on the distribution of the population, it was assumed that people are evenly distributed in their sectors of origin. Thus for each cell the population was obtained by dividing the number of population in each sector within which it is located by the number of cells in that sector. The same process was followed to write cells informations to the hexagons table.

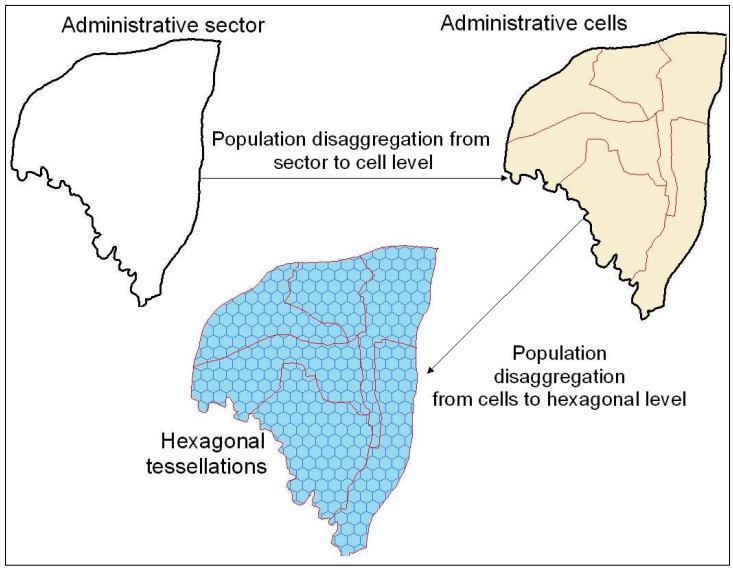

Table 4-2 Hexagonal tessellation and Population disaggregation

Computation of population within different travel time thresholds

After the disaggregation, the cells table with population information was combined with the previously created road network with walking time information using ArcGIS spatial join tool in order to later know the travel time within each cell. Using the same tool, the table of cells with walking time information was combined with the table of hexagons with population information. Based on this table population size was computed for different walking time thresholds. This table also allowed to compute served and unserved population within different urban land use types mainly planned residential and informal settlements

Comparison of secondary and empirical results

As suggested by Haynes (2006) it is worth to verify the accuracy of GIS estimates by comparing them with reported journey times and straight line distances using graphical, correlation and regression techniques. In our case this was possible by comparing GIS results with the distance and travel time that patients reported during field interviews.

4.3.2. Discriminant validity of access dimensions and Identification of underlying indicators

Factor analysis using principal component method was applied to model correlation between indicators and to show the extent to which different sets of indicators reflect different underlying access concepts. first, correlations between all indicators was calculated in order to check if there is no multicollineality problems, after this, an exploratory factor analysis was performed and different underlying factors were identified, corresponding to the five dimensions of access. Factors with eigenvalues greater than one were rotated by the varimax method to clarify the interpretation, and indicators with loadings less than 0.3 in all factors were dropped. After this step of validity check, indicators with high importance were identified within each dimension and were considered as priority indicators for health planners. SPSS 16.0 was used for the analyses**.**

4.3.3. Creation of composite measures of access dimensions

Composite measures of variables are created by combining two or more separate empirical indicators into a single measure. Composite measures of access dimensions were developed by combining outmost indicators obtained from factor analysis. This practice is commonplace in social sciences as it helps to aggregate a large number of observable variables an underlying concept, making it easier for humans to understand the data. This was found useful for policy making as it considers variables which need more attention. The process followed in the creation of composite measure was based on various literature such as Penchansky and Thomas (1981) and Kent (2001). Prior to their summation, selected underlying indicators were standardized and adopted values between 0 and 1. The developed composite scores also range between 0 and 1 and the lower the score, the better is access attainment.

4.3.4. Evaluation of access in line with health policy

After the analysis of the five dimensions the comparison was made between the observed attainment of access dimensions and the standards fixed in National health policy in order to highlight areas of priority considering dimensions as whole, while tackling health services provision issues.

4.3.5. Comparison of access attainment between health centers.

Using box plots, from explorative statistics, dimensions scores (composite scores) were compared between visited health centers in order to ranks them in terms of good or poor access.

5. Evaluation of access to primary health care

This chapter presents the results of the analysis. General characteristics of sample health centers and sample patients are first described and individual indicators of access dimensions are then analyzed. After the analysis of indicators, underlying ones are selected within each dimension and later used to create composite measures of access dimensions.

5.1. Health centers characteristics

Field data collection was carried out to 7 governmental health centers in the city of Kigali namely Butamwa, Busanza, Gikomero, Kabuye, Kagugu, Kinyinya and Muhima health centers. The data gathered from these are the total number of the population served by the health center, patients attendance rates, origins of patients attending the health centers, health status figures of patients, availability of human resources in the health center (number and education levels of staff members), types of services offered by the health center, opening days per week and operating hours per day, the number of hospital beds, availability of laboratories and pharmacies, and the types of insurance schemes accepted by the health centers.

5.1.1. Population coverage and attendance rates

In figure 5.1, it appears that 4 health centers do not have any problem related to the size of served population as the maximum served is below 20000 people suggested by the current health policy. The problem of exceeding size of served population was reported to only two health centers namely Kagugu and Muhima which serve higher number of people respectively 35848 for Muhima and 30623 for Kagugu.

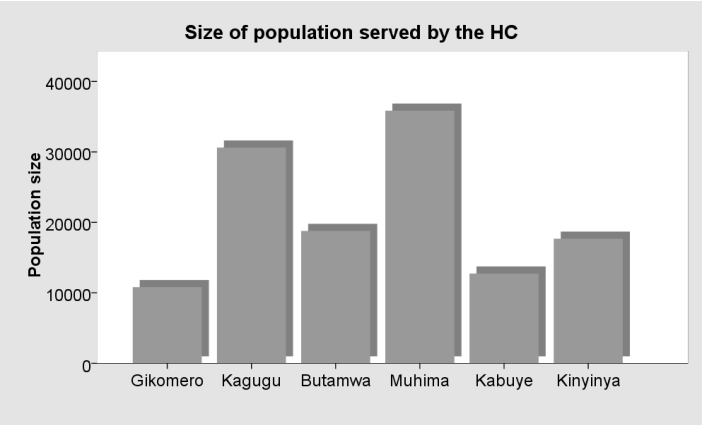

Figure 5-1 Population served by health centers

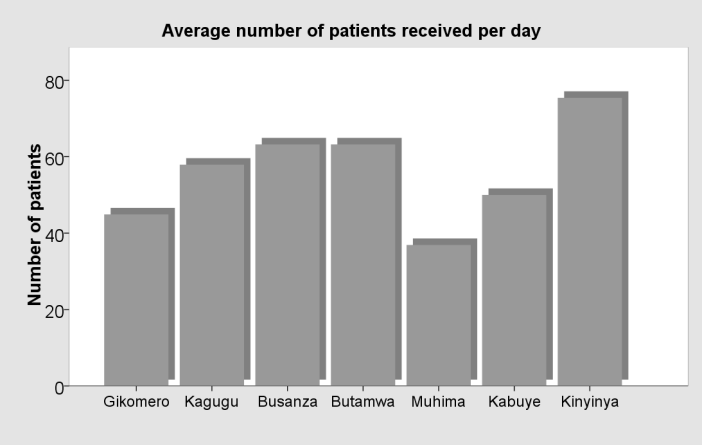

Figure 5-2 Number of patients received per day

5.1.2. Human resources

As depicted by **figure 5-3,** there is still a problem related to the capacity of health centers in terms human resources in health centers especially with regard to medical staff qualification. Among all health centers only Kagugu has one medical doctor who also is not permanent. Two health centers namely Butamwa and Busanza do not have any medical staff member holding an A1 degree while the norms stipulate that the head of the health center should at least hold an A1 degree in health related studies. Compared to other health centers, this A1 qualification is relatively attained in Muhima, Kinyinya and Kabuye health centers which have more than one staff member with A1 degree. Most of staff members hold an A2 degree in nursing, with numbers ranging between 12 as the lowest for Busanza health center and 20 as the highest for Muhima health center.

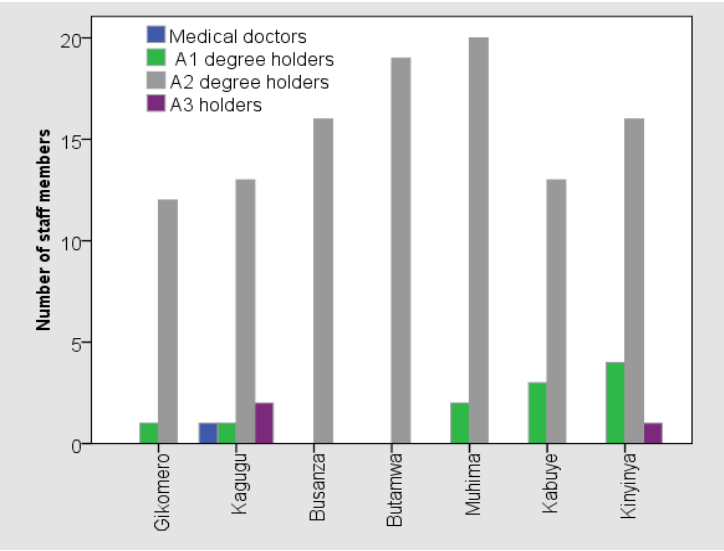

Figure 5-3 Distribution of medical staff per health center

5.1.3. Available Services

In respect to the type of services, all health centers offer the same range of basic services consisting of general consultation, basic laboratory testing, minor surgery, family planning, prenatal consultation,

maternity, immunization, nutrition programs, growth monitoring, promotional activities, hospitalization and distribution of drugs. Special services related to the fight against AIDS are also available in all health centers consisting of Voluntary Counselling and HIV Testing services (VCT), Prevention of Mother-To-Child Transmission of HIV services (PMTCT) and distribution of antiretroviral drugs (ARV) for HIV infected patients. These services have been made available to all population and contribute to the eradication of the scourge of HIV/AIDS.

5.1.4. Health centers equipment

Hospital beds

The distribution of hospital beds per health center (figure 5.4) is depicted as follows: 9 beds for Busanza, 12 for Butamwa, 17 for Kinyinya, 20 for Gikomero, 21 for Kagugu, and 39 as the highest for Kabuye. Unfortunately the number of hospital beds for Muhima health center is missing, thus it is impossible to compare it with the rest of the group.

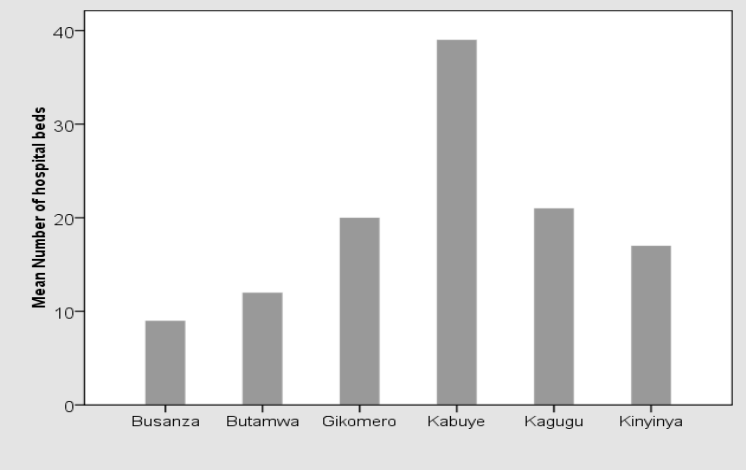

Figure 5-4 Distribution of hospital beds per HC

Other equipment

All 7 health services are equipped with one laboratory and one pharmacy so as drugs can immediately be distributed to patients after prescription. The major tests carried out by the laboratories in these health centers are tuberculosis, *malaria*, intestinal parasites and Sexual Transmissible Diseases including HIV/ADIS. Each of the seven health centers possess one ambulance, for transportation of transferred patients to high order facilities

5.1.5. Operational organization

With regard to operating days per week and hours per day, all 7 health centers are operational every day of the week. As for opening hours, all health centers are open 10 hours every day from 7 a.m. to 5 p.m. but they all have overnight services for hospitalization service and emergency cases.

5.1.6. Services payment

The payment of services in the seven health centers can be done by using a health insurance card and or by paying out of pocket.

Insurance coverage

Based on 2008 records, the highest proportion of patients who attended each of visited health centers were those covered by the Community Based Health Insurance scheme (CBHI), respectively, Gikomero 100%, Busanza 80%, Butamwa 85%, Muhima 95%, Kabuye 86%. Data on insurance coverage were missing for Kagugu health center. Other health governmental issued insurance namely la Rwandaise d'Assurance Maladie (RAMA), Military Medical Insurance (MMI), Insurance offered by the fund for genocide victims (FARG) and private medical insurance offered by la Société Rwandaise d'Assurances (SORAS) and (Mediplan) were used by the remaining lower proportion of patients. At each visit to the health center, patients must present their insurance membership card and case of CBHI, a member has to pay an extra default amount equivalent to $0.5 for every visit to the health center. The figure 5-5 below shows the location of visited health centers and the origins (cells) of sample outpatients.

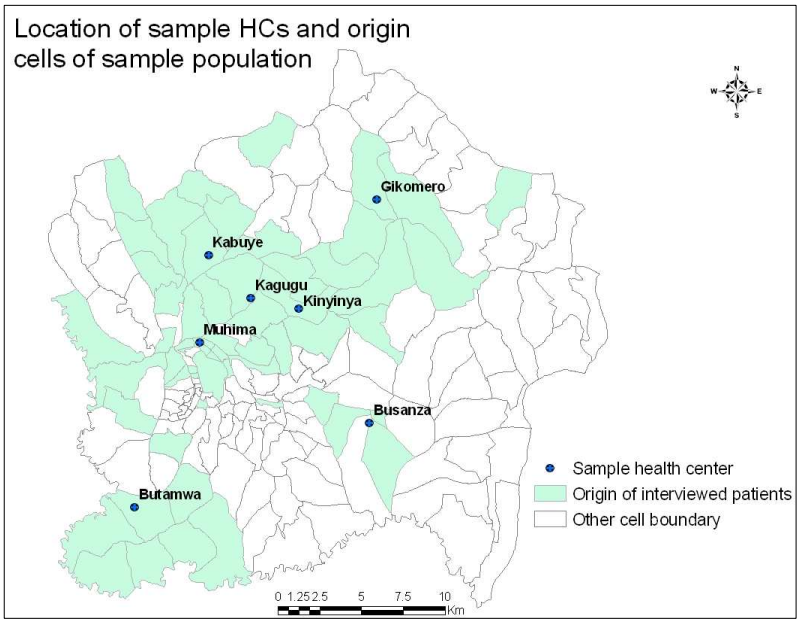

Figure 5-5 Location of visited health centers and origin of sample outpatients

5.2. General characteristics of patients

Primary data was collected from a sample survey of 316 outpatients at 7 health centers as mentioned earlier. Through interviews their socio-economic characteristics and access related information have been recorded in individually administrated questionnaires. Socio economic and demographic data comprise patients' gender, age, level of education, employment status, their status in the household and their monthly income as depicted in table 5.1. The purpose of including individual characteristics was based on the fact that they may influence access to health care.

Respondents' age ranges between 9 and 64. The large proportion of respondents (79%) corresponds to the age category between 20 and 40 years. Other age categories represent relatively small proportions as respondents less than 20 years old represent only 5.1%. A proportion of 37.3% of respondents are heads of their households while 67.7% are not. With respect to their level of education, the highest proportion of respondents completed only primary education (49.1%), respondents who did not attend school is 27.2%, and those who completed high school represent 8.2%. The remaining proportion is distributed among those who followed other vocational trainings such (10.4). Only 0.6% of respondents have a University level. With

regard to employment status, 72.1% of patients are unemployed, 23.5% are in the private sector, while only 4.3% are government employees. Regarding their monthly income, almost 99.4% of respondents are in a low income category as they earn less than $200 per month.

Description	Category	Number	Percentage %
Gender	Females	190	71.7%
	Males	75	28.3%
Age	<20	16	5.1
	20 – 30	177	56.0
	31 – 40	74	23.4
	41 – 50	32	10.1
	> 50	17	4.3
Highest education Level	Illiterate	86	27.2
	Primary school	155	49.1
	CFJ	33	10.4
	Secondary school	26	8.2
	University	2	.6
Employment status	Unemployed	150	72.1%
	Government employees	9	4.3%
	Private and informal sector	49	23.5%
Income (US dollar Per month)	Low income (< $200)	174	99.4%
	Medium income ($200 - $400)	1	0.6%
	High income (> $400)	0	.0
Status in the Household	Head of household	118	37.3
	Not Head of household	198	62.7

Table 5-1 Characteristics of sample patients

5.3. Analysis of individual indicators of the five dimensions

All indicators hypothesized to measure access during data collection are described in the following section with the aim to assess variations in terms of access.

5.3.1. Geographical Accessibility

Objective indicators used to measure geographical accessibility are travel time, travel distance and mode of transportation. Subjective questions were also asked on how patients feel about the distance they travel to reach health centers and how they feel about the topography on their way to health centers. Answers about subjective questions were recorded on a three point Likert ranging from satisfied to dissatisfied

In order to accurately measure travel time and distance to health centers, GIS analysis was used and results were compared to those reported by patients. Results from road network based analysis show variations in the walking time from cells centroids (assumed to be patients' origins) to the nearest health center. GIS analysis shows that the shortest walking time in the area is 3 minutes while the maximum time is approximately 5 hours with the mean travel time of two hours, and a standard deviation of almost one hour 20 minutes. Based

on the comparison of spatial analysis results and reported travel time, spatial analysis seems to be realistic in terms of the shortest walking time since there is only 2 minutes difference from both results. However, differences arise in the maximum walking time, 5 hours from spatial analysis against 3 hours from reported travel time with a mean walking time of approximately one hour and a standard deviation of 44 minutes.

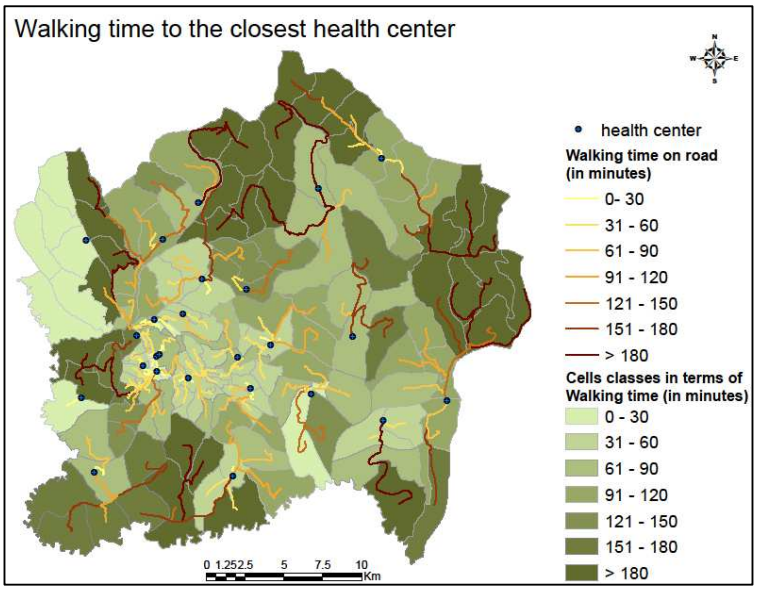

Figure 5-6 Walking distance to the nearest health center with 30 minutes thresholds

Assuming that people visit the closest health center to their homes , the analysis of travel distance based on Euclidian measures(*figure 5.7*) shows that the longest distance that individuals must travel is 10.5 km with a mean distance of 4 km and a standard deviation of 2.6 km approximately. Compared with reported travel distances by patients, the longest travel distance is exactly similar to that obtained from spatial analysis (10.5 km), without significant difference in the mean travel distance. The standard deviation is also almost identical (2.5 Km). The computation of walking time based on the road network showed different results with the shortest walking time of approximately 400m and a longest walking time of approximately 15km. From this comparison it can be concluded that even though Euclidian measures have numerous weaknesses, they portray adequately the travel distances in Kigali.

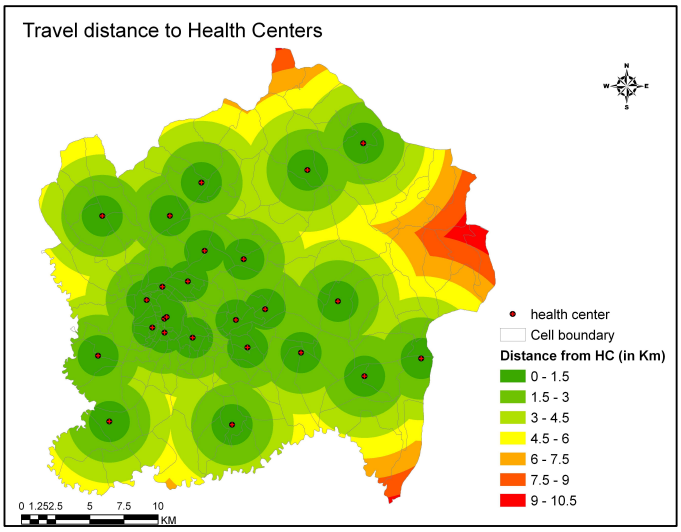

Figure 5-7 Euclidian distances to health cent

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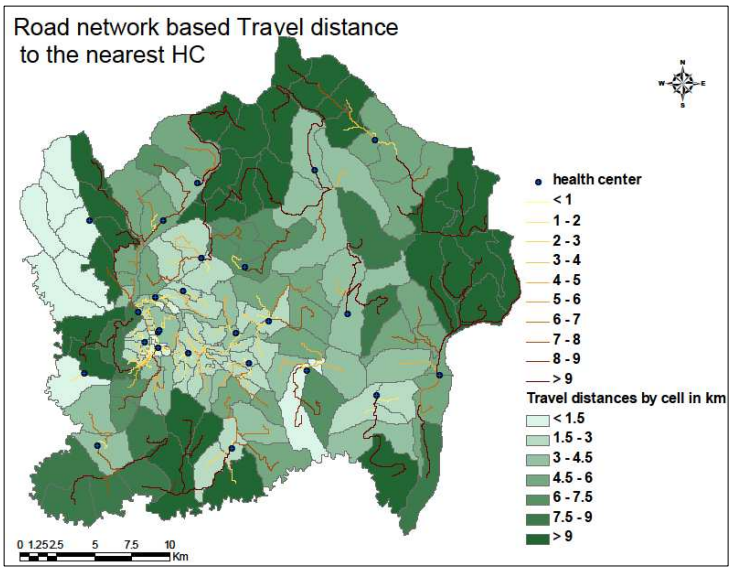


Figure 5-8 Network based travel distance to the nearest HC

As portrayed by *figures 5.6 5.7 and 5.8,* the time and distances that people have to travel to reach health centers are much longer in the eastern cells of the city and within some areas in the north and south. This can be related to two major reasons namely the large size of administrative cells in that area and a relatively less dense distribution of health centers in the same area. It is worth to also note that the road network is less dense in that part of the city compared to the rest of the area, especially the southern and central parts.

Mode of transportation

In overall, walking is the most dominant mode of transportation that patients use to reach health centers, approximately 75% of respondents reported going to health centers by walking, 9% used public transportation (bus), 8% used motorbike as another type of public transportation, while approximately 5% used bicycles, though they did not specify if they own them or not and only 2 % used their own car to reach health centers.

The subjective aspect of geographical accessibility was assessed by means of questions related to satisfaction with travel distance and the perceptions of respondents about the topography configuration on their way to health centers. Approximately 46% of respondents reported being satisfied with the distances they had to travel to reach health centers, 41% were in between as they were neither satisfied nor dissatisfied. From the subjective point of view, it can be concluded that travel distance to health centers is not a problem since only 12% of respondents reported a total dissatisfaction with travelled distances. Note that the levels of satisfaction decrease with greater distances (Table 5-2).

The topographie did not either seem to be a n issue as , 96% of the respondents were satisfied and claimed that topography is not an obstacle, only 4% said that it is a barrier to access health centers.

Travel distance	Satisfaction levels			Total
	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	
0 - 1Km	67	11	3	81
1 - 2KM	30	34	1	65
2 - 3KM	23	26	9	58
Above 3KM	23	58	27	108
Total	143	129	40	312
Percentage	45.8%	41.3%	12.8%	100.0%

Table 5-2 Satisfaction with travel distance

Land use and accessibility

As described earlier, the city of Kigali is rural to a large extent, while the urbanized area is spatially limited. Within urbanized area informal settlements occupy the largest extent (more than 70 % of the total urbanized area). The analysis of accessibility in relation to these types of land use shows that the urbanized area, located in the central part of the city corresponds to the area of high accessibility in terms of travel distance and time from people's residences to health centers. This is in fact due to a high density of the road network in urbanized area which serves as good linkage between densely distributed health centers and relatively smaller administrative cells in the same area. More than 60% of health centers in the city are located in the urbanized area which represents only 12% of the whole area. The rural area is contrary characterized by a less dense road network, smaller number of scattered health centers and larger administrative cells, which make travel distance and time longer than those accounted for in urbanized area.

Population, land use and accessibility

The distribution of population in Figure 3-4 shows that high population densities are concentrated in urbanized area in contrast with low densities found in rural area. 75% of the population in Kigali lives in urbanized area which represents only 12% of the whole area as above mentioned. For this reason most people travel short distances as they move on a limited area.

Comparing rural and urban settings, the number of people having to travel longer distances to health centers is higher in rural area, where more than 80% walk more than one hour to reach the nearest health center, in contrast to urban area where approximately 60% of the population travel less than 1 hour to reach the closest health center. Also differences arises between rural and urban area since 35% of the population in rural area have to walk more than 3 hours to reach the closest health center , while in urban area only 2% of the population have to walk more than that.

Walking time	Population size within rural area	%	Population size within urban area	%
0 –30	25896	12%	56523	10%
31–60	4868	2%	274039	50%
61–90	30359	14%	106190	19%
91–120	41173	20%	60250	11%
121 –150	12072	6%	10458	2%
150 – 180	21696	10%	27659	5%
>180	74234	35%	9670	2%
Total	210298	100%	544789	100%

Table 5-3 Population distribution within different travel time thresholds

Zooming inside the urbanized area, the proportion of the population within different walking time threshold is not different at all for planned and unplanned residential area. For both land use types, the highest most people (63% in planned area and 65% in unplanned area) walk less than one hour to reach the closest health center. However little differences are observed, in unplanned area 7% of the populations have to walk more than two and half hours while in planned area no person has to travel such distances to reach the closest health center.

Walking time	Population size within Planned area	%	Population size within Informal settlements	%
0 –30	14732	6%	45998	12%
31–60	135815	57%	211533	53%
61–90	64876	27%	53953	14%
91–120	13205	6%	52874	13%
121 –150	7675	3%	5370	1%
>150	0	0	26871	7%
Total	236303	100%	396599	100%

Table 5-4 Population and travel time in planned and unplanned urban area

Behavioral choice of health centers

While Health planners assume that people will visit the nearest health facility to their residence, the analysis of patients' choice of health centers (figure 5-9) depicts that in general this assumptions is close to reality in the city of Kigali. The closeness of health centers were identified based on the computation of walking time along the road network, as explained in section 4.3.1. The analysis shows that more than 87% of the population visit he closest health center and the remaining proportion bypasses the nearest health center. Compared to other health centers however, Muhima health center makes an exception, as it attracts people from numerous cells in the city than any other health center in the area, 37% of the populations who visit further health centers go to Muhima health center. This could be explained by the reputation of this health center for the quality of care that it provides and its location within urbanized area along with an easy

connection to the remaining part of the city through a relatively adequate road network. Within Kigali, some people have to travel up to 10 km to attend this health facility while in general they had the possibility to visit health centers within less than 2 km average distance from where they live. One more reason of choosing Muhima could also be that, in addition to those above mentioned, the sizes of cells in the central part of the city where it is located, are relatively small and the distribution of health centers in that part of the city is also relatively dense, with health centers close to each other, which give to the population many options while choosing the health center they visit. Figure 5-9 shows the location of visited health centers and nearest origin cells as well as further origin cells of patients visiting them.

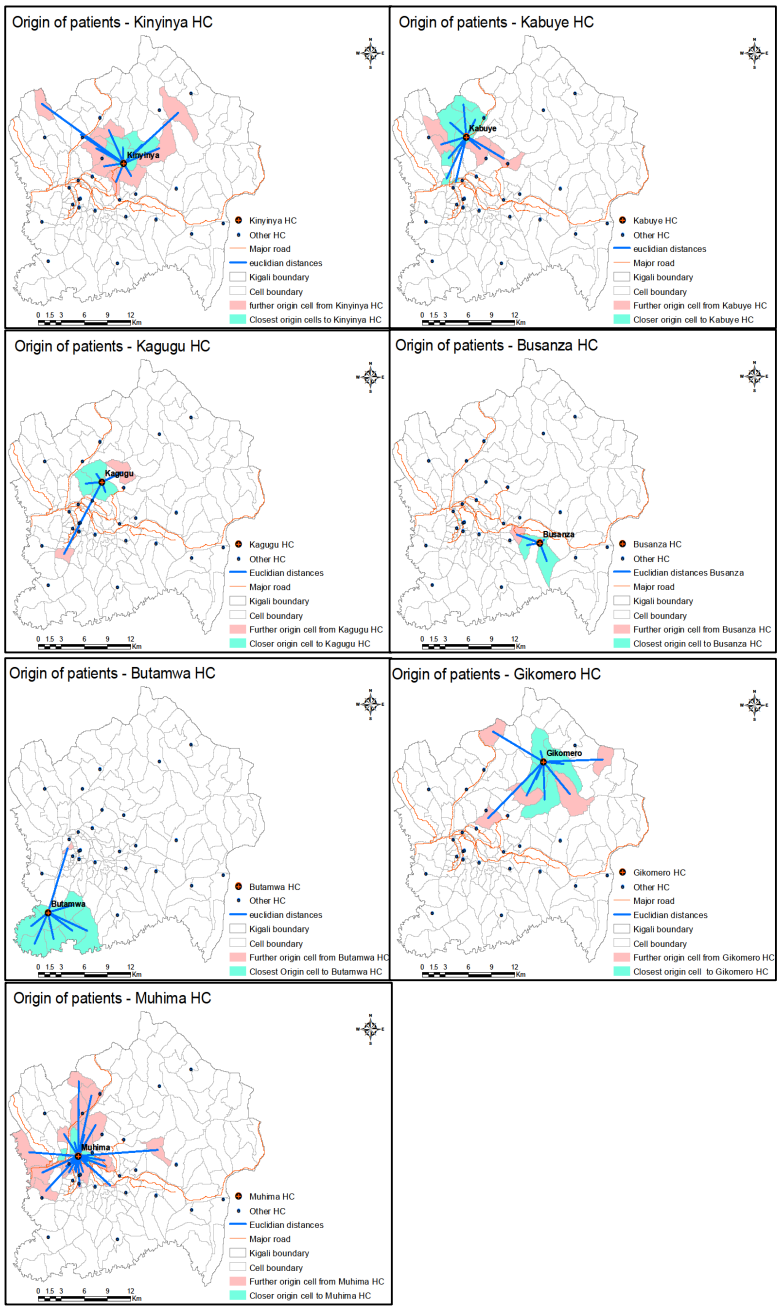


Figure 5-9 Origin cells of patients and visited health centers

5.3.2. Availability

The objective measurement of availability in primary data was the type of services that patients were seeking while the subjective measurement was done by asking patients how they feel about the services they received compared to the services that they needed. Overall, respondents were seeking various types of services as identified in the paragraph under sub heading 5.1.4**.** The highest proportion of respondents though, (51%) came for consultation while the other service which relatively counted many people (16%) was laboratory testing. Other services represent respectively 8.2% for children growth monitoring, 7.3% for family Planning, 5.1% for children Immunization, 3.2% for drugs collection (mostly antiretroviral for HIV/AIDS), 1.6% for minor surgery, 1.3% for promotional activities and only 0.3% for maternity services. From the subjective point of view, the availability of services in Kigali is not problematic as 84% of respondents reported having received needed services and satisfied by them. However, the comparison of satisfaction levels by type of services shows that variations exist within different types of services. Results show lower satisfaction levels for family planning services with 69% of respondents who reported being dissatisfied.

Needed services	Satisfaction level	
	Satisfied	Dissatisfied
Consultation	86%	14%
CPN	96.%	4%
Dressing	100%	
Drugs collection	100%	
Family Planning	39%	61%
Immunization	100%	
Laboratory test	94 %	6%
Maternity	100%	
Minor surgery	100%	

Table 5-5 Satisfaction with offered services

The spatial analysis of the population served by each health center was done based on secondary data Available by sector but disaggregated to hexagonal level as explained in **methodology.**

In general health centers in rural area appear to serve limited number of people compared to those located in urban area. The reason is that, the majority of the population is concentrated in the limited size of land occupied by urban settings. As shown earlier in section 5.1.1 and again portrayed by figure 5-10, there is still an issue related to availability in terms of the population served by health centers. While norms suggest a maximum of 20000 people per health center, results shows that the majority of health centers still serve a population number bigger than that with some health centers serving a population twice the limit number.

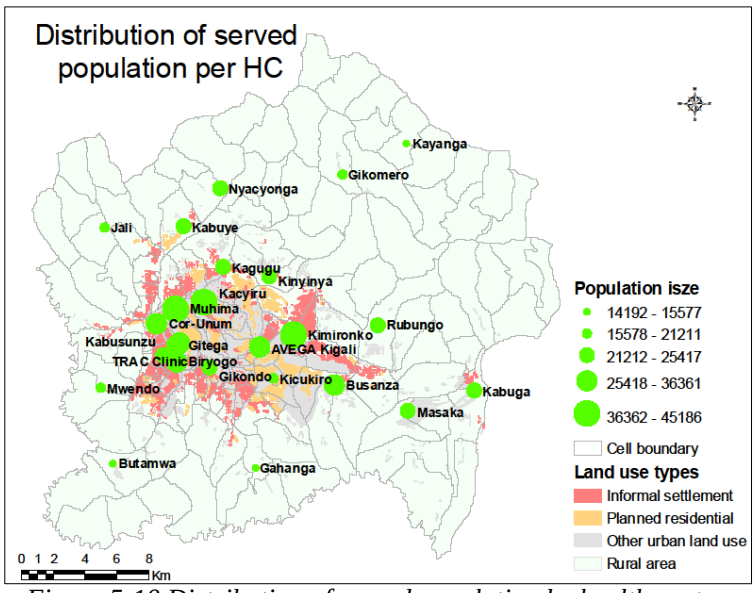


Figure 5-10 Distribution of served population by health center

5.3.3. Affordability

In order to evaluate the dimension of affordability objective questions were asked to patients about financial factors which influence their ability to pay for care namely their income, out of pocket paid for treatment the day of interview, transportation costs the day of interview, type of insurance used by respondents and insurance premium paid per year.

Results show that there is no significant variations in terms of insurance coverage as 95.7% of respondents use the same type of insurance which is the Community Based Health Insurance; hence most of them also paid the same amount of insurance premium which is 1000 RWF per year, the equivalent of approximately $1.81. Only 1.8% of respondent paid an out of pocket amount greater than that of $ 0.5 stipulated by the insurance policy. As most of respondents reached health centers on foot, the transportation fare concerned a relatively small number of respondents. Out of 316 respondents constituting the sample size, only 68 (21%) paid transportation fare. Approximately 65% of them paid less than $ 0.5, while the rest paid an amount higher than $ 1.

For the subjective aspect of affordability, questions were asked related to how respondent feel about the direct and indirect costs of services such as cost of care and transport fare and income as well as insurance coverage major factors influencing their ability to pay. Responses were recorded on a three point Likert scale ranging from satisfied to dissatisfied, similarly to other dimensions. The results about how respondents feel about the services received using their health insurance generally show high levels of satisfaction as 82% of respondents affirmed that they were satisfied with the services offered by their insurance. With regard to the cost of care, satisfaction levels were also high as approximately 90% of respondents reported being satisfied with the cost of treatment. However, less satisfaction was recorded for the transportation fare, whereas only 27% of those who paid transportation fare claimed being fully satisfied with the fare while the rest were divided between total dissatisfaction and neutral (neither satisfied nor dissatisfied). It can be said that the high level of satisfaction with insurance coverage and services costs is generally linked to the current policy which aims to increase the use of health services by making them affordable for everyone. As explained in chapter 3 under subheading 3.8.1, the affordability of services in public health facilities is made possible for poor, unemployed and informally employed population through the subsidizing of preventive services by the

government and the creation of CBHI. The absence of variations in satisfaction levels with services costs and insurance services can be linked to the fact that most of respondents are covered by the same insurance schemes (CBHI) and thus obtain the same services from their insurance coverage. Low satisfaction with transportation cost on the other hand didn't show any relationship with other factors except the amount of money paid for transport. The higher the amount of money paid for transport the lower is the satisfaction level with transport cost. The correlation between these two variables showed a positive relationship (R=.557 with a high significance level p <.001). Thus it can be concluded that even though the cost of treatment is not a problem, either transport costs are high or some people still can not afford transportation costs. There was no analysis of satisfaction with cost between different health centers as the cost of treatment is standard in public facilities.

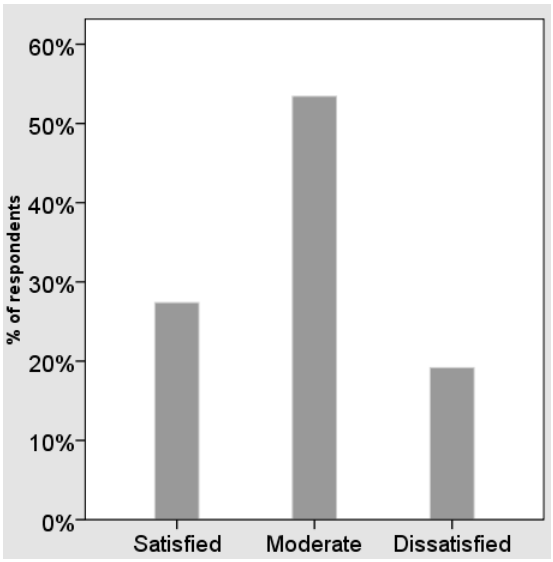


Figure 5-11 Satisfaction with service costs

5.3.4. Accommodation

As for the previous dimensions, accommodation was also evaluated using objective and subjective measures. Objective measures of accommodation took into consideration the time spent by respondents waiting in the lobby before being checked and the time spent waiting for laboratory results in case there were laboratory tests. The majority of respondents (63%) reported that they waited less than 30 minutes to get check up and the rest of respondents waited longer than that. Almost all patients who waited more than 30 minutes before being checked expressed total dissatisfaction and said that they waited for long. With regard to waiting time for laboratory results, patients who waited less than 1 hour (25% of respondents) expressed total satisfaction while those who received their results within a time period of 1 to 3 hours (59% of respondents), were slightly satisfied saying that waiting time was not too long. Total dissatisfaction was reported by those who waited longer than 3 hours (15%) and claimed that waiting time was too long. Other subjective questions were asked about the satisfaction with cleanness of visited health centers and the satisfaction with operating hours. The operating hours were not an issue as the majority of respondents (82%) were completely satisfied with operating hours. From this point of view it can be said that the operating hours as presented in the paragraph under sub heading 5.1.5**,** are generally convenient for the provision of primary health services. Regarding the cleanness of the facility only 58% were somehow not satisfied and 4% completely dissatisfied. Among visited health centers, Muhima, Butamwa and Kagugu have patients who waited longer than patients

from other health centers. Among the seven visited health centers, Kinyinya is the highly ranked for good cleanness while Kabuye has the highest number of patients dissatisfied with general cleanness.

a) b)

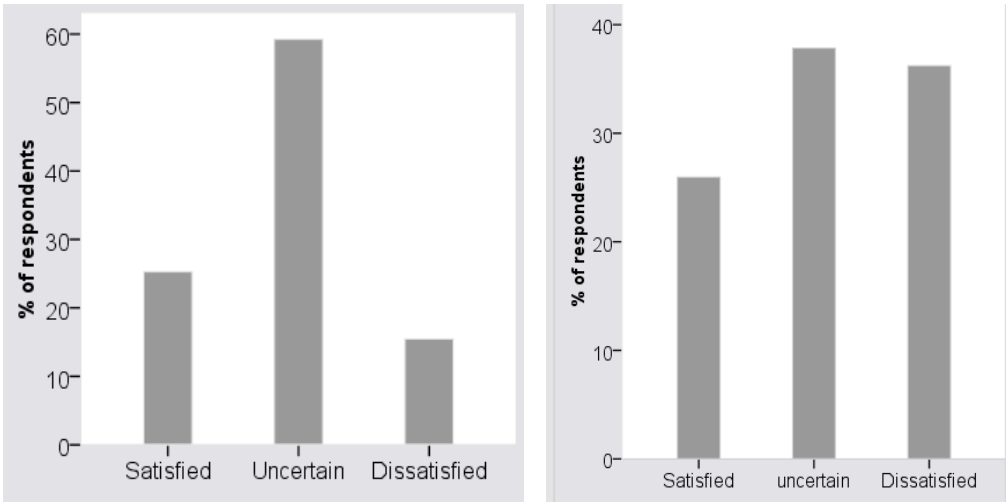


Figure 5-12 Satisfaction with waiting time *for laboratory results* (*a)*
Figure 5-13 Satisfaction for consultation waiting time (b)

5.3.5. Acceptability

Acceptability was subjectively measured considering perceptions of patients about their interpersonal relationships with medical staff. Respondents were asked questions regarding how they felt about the courtesy of medical staff members, the provision of informations regarding treatment and the time allocated by staff members while listening to patients explanations. All questions related to these three items were recorded on a three point Likert scale each, ranging from satisfied to dissatisfied.

With respect to the courtesy of medical staff members, which can be explained as the kindness that they manifested towards patients, 60% of respondents were completely satisfied, 37% reported a medium level of satisfaction stated as neither satisfied nor dissatisfied while only 3% reported total dissatisfaction with those attitudes of medical staff and those who expressed total satisfaction visited Muhima and Kagugu health centers. With regard to satisfaction with information provision it was not a problem as the majority of respondents (70%) reported total satisfaction, 23% expressed medium satisfaction, while the smallest proportion of respondents (7%) complained as being dissatisfied. Finally, the time spent listening to the patient was not an issue as 97% of respondent were happy with this aspect; only 3% expressed negative feelings of dissatisfaction.

5.4. Overall evaluation of access dimensions

The previous sections consisted of an individual description of different variables hypothesized at the beginning to operationalize the five dimensions of access. However their description does not tell if their selection fits well with the specific dimensions that they were thought to measure. The following section

intends to verify their validity in order to be able to correctly evaluate access dimensions as wholes. At this stage the reliability and validity tests were performed and composite measures of access dimensions were created. After the creation of composite measures, access dimensions were evaluated at health center level.

5.4.1. Discriminant Validity test of access dimensions

Prior to validity test, internal consistency check was carried out on primary data using Cronbach's Alpha test, to assess the reliability of the Likert scales used to record subjective perceptions in the questionnaire and the analysis yielded an acceptable value of 0.6.

After reliability test, discriminant validity test was performed in order to verify the multidimensional aspect of access and to make sure if relationships between specific indicators and access dimensions that they are supposed to operationalize are as previously hypothesized. This was carried out by performing Factor Analysis on 23 quantitative variables used to operationalize access dimensions as described in chapter as presented in Appendix C, . The factor analysis method used is Principal Component Analysis

Prior to the analysis, the data was qualified for factor analysis based on the fulfilment of two basic criteria. the first criterion was the one suggested by Comrey and Lee (1992), stipulating that for factor analysis, the size of the sample should be at least 300 cases (which is 316 in our case). The second criteria was the results of Kaiser-Meyer-Olkin (KMO) test, which yielded good value above 0.5 (almost 0.6 in our case) along with a Bartlett's test of sphericity highly significant ($p<.001$).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.589
Bartlett's Test of Sphericity	Sig.	.000

Looking at communalities of al variables, their accounted variability was relatively high for all 23 variables and they were all considered in factors extraction. Factors extraction was performed using Kaiser's criterion stipulating the retention of factors with eigenvalues greater than 1. Ten factors emerged with values greater than 1 and with a total percentage of variance of 70%. (Appendix E)

After factor analysis the clustering of different variables used to measure access dimensions revealed the multidimensional aspect of access as expected and in general the indicators selected in the beginning to operationalize access dimensions are as hypothesized**.** Do to a large size of the resulting table, Result of factor analysis is shown in appendix D.

The results from factor analysis show that:
Factor 1 and 2 are most highly correlated with variables that were hypothesized to measure accommodation.
Factor 3 show high loadings related to variables used to measure geographical accessibility
Factor 4, 7 and 9 highly correlates with attributes of acceptability
Factor 5, 6, 8 and 10 have the highest loadings from items used to measure affordability

Unexpected observations from factor analysis were that the satisfaction with offered services used as subjective indicator of availability clustered in the same group of accommodation attributes. This may imply that availability could be adequately measured by providers to population ratios or by selecting more

indicators than those considered in this study. Another observation is that, with regard to geographical accessibility, perceptions about topography did not correlate with any factor which means that they are not relevant while measuring access in Kigali. Health center cleanness also highly correlated with attributes of acceptability while it was supposed to measure accommodation.

5.4.2. Selection of underlying indicators of access dimensions

The purpose of selecting underlying variables within each dimension was to identify indicators which should be prioritized while planning for primary health care provision. After the regroupement of variables in to appropriate dimensions in the previous section (section 5.4.1.), factor analysis was again performed for attributes of each dimension separately in order to see those which have higher loadings and those which contribute less. Those with higher loadings within each dimension were considered as predictors of that dimension. The benchmark loading value is selected arbitrary based on the author's judgement as there is no formal threshold to be applied in the selection. Only attributes with loadings greater than 0.6 are retained as identifying the dimensions.

Within the dimension of geographical accessibility two objective indicators (travel time and travel) distance are both retained as they show high loadings on the factor with 0.804 and 0.836 respectively. The subjective perception of travel distance also is included as it also shows a high loading value of 0.773. It can then be said that travel time and travel distance are the most problematic indicators of geographical accessibility and need to be taken into consideration while locating health facilities in the area.

Within the dimension of availability no factor analysis was performed at this stage as only one hypothetical attribute of availability (satisfaction with offered services) previously loaded on another component of accommodation. However, even if it could have corresponded to the availability factor, it would not be eligible for factor analysis as it was unique.

For the dimension of affordability, only the amount of money that respondents paid for transportation seems to be a problem as the amount paid for transportation and the satisfaction with that amount are the only attributes with higher loadings on the new affordability component. The costs of treatment, out of pocket and insurance satisfaction do not show any importance within this dimensions.

Within the dimension of accommodation, the outmost variables which need more attention are the waiting time before getting checked and the waiting time for laboratory results which loadings are 0.737 and 0.687 respectively. Operating hours do not load highly on accommodation component and thus can be considered as non problematic in this dimension.

Problematic indicators of acceptability dimension are the satisfaction with the provision of information regarding treatment and the courtesy of medical staff as they showed higher importance in terms of loadings, with 0.797 and 0.786 respectively. The satisfaction with the time spent listening to patients' explanation does not seem to be an issue as this variable did not load highly on acceptability component compared to the previous two.

Within this dimension, correlation analysis was performed on the two outmost attributes of acceptability with the socio-demographic characteristics of the population (age, gender and education level) in order to see if they influence the satisfaction. The results did not show any relationship between the subjective attributes of accessibility and characteristics of the respondents. From this observation, it can be concluded that socio-

demographic characteristics of the population in Kigali do not influence the outcomes of primary health care in Kigali.

As a partial conclusion as this stage, it appears that the most problematic indicators of geographical accessibility are travel time and travel distance, while important indicators of affordability is the money paid for transport. For accommodation, the outmost indicators are waiting time for consultation and waiting time for laboratory results and finally for acceptability only the provision of informations regarding treatment and the courtesy of medical staff need to be improved. Availability could not be adequately measured by primary data.

Access dimension	**Indicators**	Loadings
Geographical accessibility	Travel time to health center	.804
	Travel distance to health center	.836
	Satisfaction with travelled distance	.773
Accommodation	Satisfaction with Health Center cleanness	
	Satisfaction with Operating hours	-.513
	Satisfaction with waiting time for consultation	.725
	Waiting time for laboratory results	.687
	Satisfaction with waiting time for laboratory results	.667
	Waiting time for consultation	.737
	Satisfaction costs of services	
Affordability	Out of pocket	
	Transportation fare	.869
	Satisfaction with health insurance services	
	Income of respondents (RWF)	
	Satisfaction with transport fare	.873
	Satisfaction with time spent listening to the patient	
	Satisfaction with medical staff courtesy	.797
	Satisfaction with listening	.591
	Satisfaction with information provision	.786
Extraction Method: Principal Component Analysis		

Table 5-6 Underlying indicators retained for composite measures

In the table above, cells without loadings had values less than 0.3 and those were not shown based on previously defined settings.

5.4.3. Creation of composite measures of access dimensions.

Previously, dimensions of access have been described through their individual indicators. However it is more appropriate to consider each dimension as a whole as proved by the previous analysis. The consideration of

each dimension as a whole is useful in a way that it allows the measurement of complex concepts adequately than single indicators. For this reason, the method of summated ratings was used to create for each dimension a composite measure rather than referring to it by its individual indicators. Based on the results from the previous factor analysis performed for each dimension separately, the outmost indicators for each dimension were used to create composite measures.

Using methods borrowed from Penchansky and Thomas (1981) and Kent (2001) composite measures of access dimensions were obtained by summing the standardized values of the relevant indicators under different dimensions of access and by computing their average value for each case, taking into account the handling of missing data. For each dimension, standardized values were summed up and divided by the number of indicators within a specific dimension.

Assuming X_1, X_2, …, X_p as values of measurement on the p items of a latent variable. The p item is considered as one individual indicator while the latent variable is considered as an individual dimension of access. The index is thus equal to $\Sigma (X_I)/p$, the distribution of obtained scores ranges from good to poor for each dimension. The construction of these composites measures was done using SPSS considering the retained outmost indicators from previous factor analysis.

The major challenge at this stage was the problem of missing values which would make the resulting index to be wrong. Thus if few variables were missing, they were replaced by the mean score and in case the missing values are too this was dropped from the summation process. Dimensions scores are interpreted as follows: scores between 0 an 2 mean very good attainment, scores between 2 and 4 mean good attainment, scores between 4 and 6 mean moderate attainment, scores between 6 and 8 mean poor attainment and scores between 8 and10 mean very poor attainment

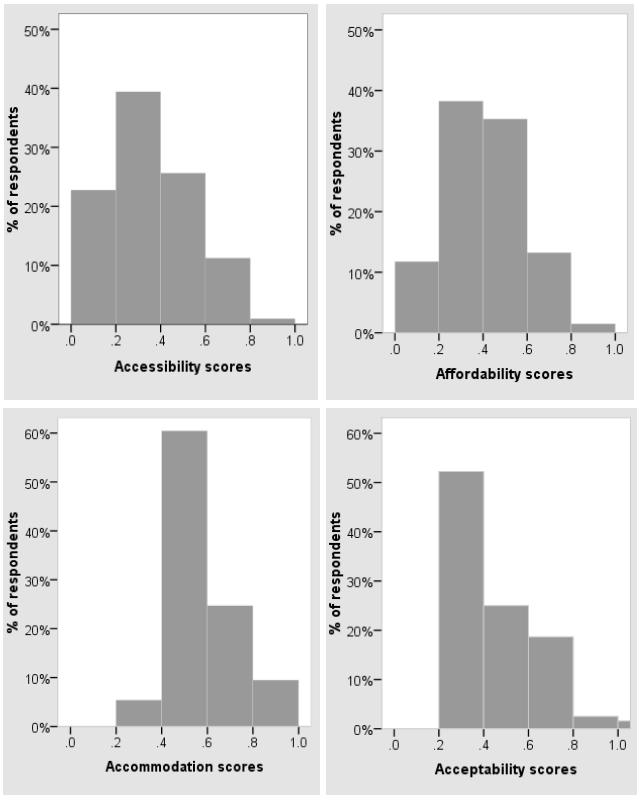
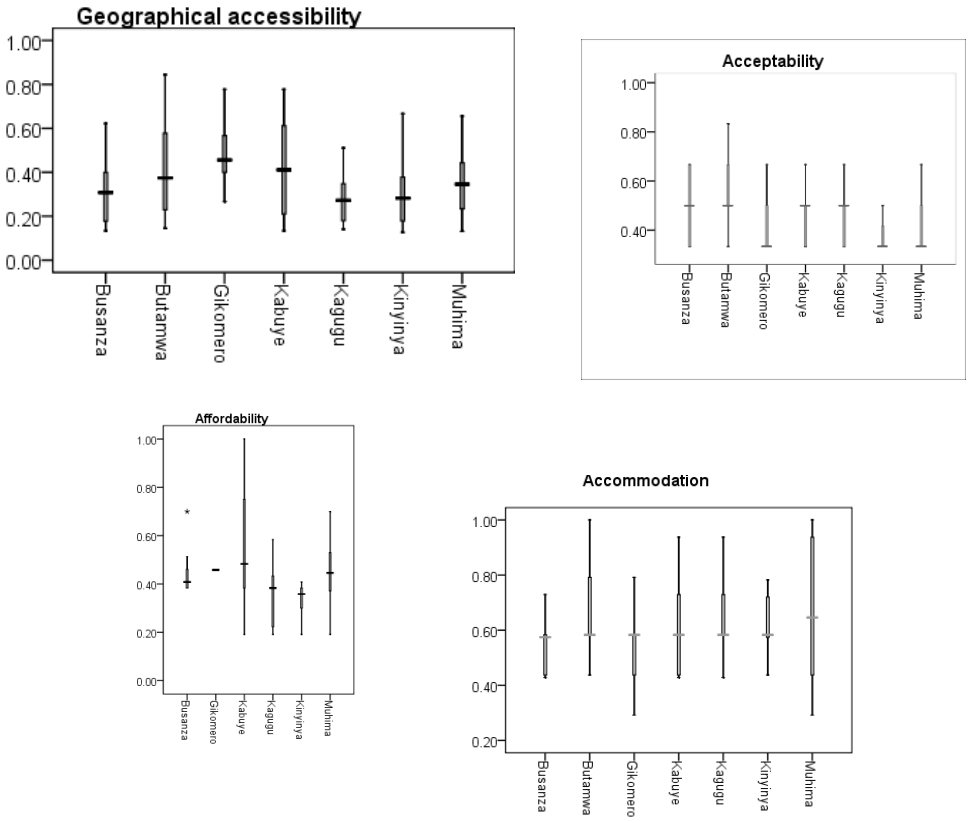


Figure 5-14Overall composite scores of access dimensions

Figure 5-14 depicts all composite scores of four access dimensions namely geographical accessibility, affordability, accommodation and acceptability. In general accessibility, affordability and acceptability don't seem to be an issue as their scores are generally good with high percentages of responses clustering between 0 and 4 scores values interpreted as very good and good. The most problematic dimensions seems to be accommodation which scores generally ranges between 4 and 6 which means moderate attainment.

5.4.4. Comparison of access dimensions scores between health centers



6. Reflection on research methodology and results

The present chapter discusses the finding from the analysis of collected data with the aim to assess the degree to which objectives of the research are reached. Within This chapter the definition of access and its operationalization and measurement are recalled, followed with the discussion about the results from the description of individual indicators used to operationalize access dimension, second, the selection of underlying indicators is discussed, and third the creation of composite measures is revisited. After the assessment of the level of objectives attainment, the conclusion is provided along with recommendations for possible future research.

6.1. Definition and operationalization of the concept of access to primary health care

The objective of this study was to evaluate access to primary care using the case study of Kigali the capital city of Rwanda. Several steps were integrated through the definition of access to its operationalization in order to provide a framework that can be used to evaluate access, a major concern of health policy.

The definition of access to primary health care has been sorted out based on a systematic review of the literature related to access. In line with the first research question of how to properly define access, it has been found that the proper way of defining access is to consider it as a multidimensional concept made up with five main dimensions namely geographical accessibility, availability, affordability, accommodation and acceptability.

In line with the second research question, the adequate approach of operationalizing the concept of access was found to be based on a proper selection of objective and subjective indicators comprising various aspects of health services users and health system characteristic, by looking at both services use and outcome such as the satisfaction.

The measurement of access dimensions as included in the third research question is a combination of different methods mainly Geographical Information systems for the measurement of spatial aspects of access dimension such as travel time, travel distance for geographical accessibility and providers to population ratios for availability dimension. Others non spatial aspects of access dimension can be well measured using other quantitative methods such as statistical methods. Both descriptive and inferential methods constitute advantageous tools to understand various dimension of access. For example principal component analysis was useful in the identification of underlying indicators of access which can be used to create composite measures of access in the context of the study area.

6.2. Data requirements and data analysis

The question of what type of data is required to measure access was answered by the collection of primary data through a sample of 316 outpatients at various health facilities in the area of study. Questions were asked to them about their individual characteristics such as age, gender, education, income, etc which are known to influence the use and outcomes of health services especially in developing countries. Other objective questions related to access were also asked to them along with their perceptions and feelings about certain aspects of primary health services.

With regard to the research question sought to elucidate alternative ways of analyzing the collected data, three main steps were used namely statistical description of individual indicators of access dimension, the identification of problematic indicators using factor analysis, as well as the creation of composite measures which can allow to consider dimensions as whole rather that referring to them through single indicators. This approach ahs revealed much strength such as handling a relatively big amount of data of different nature and the extraction of important information which can be easily used by health planners.

6.3. Access attainement in line with health planninga and policy standards

With respect to the question of how access is attained in line with health planning in Rwanda, there were major limitations as to the availability of those standards. It was not possible to find health planning standards related to all the five dimensions of access, and for those which standards were available they relate to just a single indicators. In general, available standards for geographical accessibility are only related to travel time to the nearest health center, while standards of availability are only relate to population served by health center and education qualification of medical staff.

With respect to travel time to health center, the standards stipulate a maximum walking time of one and half hour to reach the nearest health center. However this standard is developed for rural area but was used because it was the only available. Results from the analysis of accessibility have shown that in urban area this standard is mostly fulfilled with the majority of people (80%) walking less than 90 minutes to the closest health center while in rural area it is still far to be reached as only 28% of the population can reach the nearest facility within that time. (Table 5-3)

Regarding the population served by various health centers, it appears that there are still issues in that matter. The policy standards stipulate that the maximum number of people to be served by a health center in their geographical area should not be more than 20000. However the spatial analysis of availability shows that the majority of health centers, especially those located in urbanized area serve more than the fixed number.

With regard to human resources in terms of medical staff qualification, the analysis was made based on primary data and thus the situation was not generalized for the whole area. However in visited health centers issues related to medical staff qualification were recorded. While, policy standards suggest that the head of health center should at least hold an A1 degree in nursing studies, this achievement was only found to only 5 among the 7 visited.

In interesting step seems to have been achieved and this is related to affordability of care. The analysis of the dimension of affordability has shown a successful step in terms of policy since Community Based health insurance (CHI) have Cleary improved access to health care, preventing households from health-expenditure

related risks. This was proved by high levels of satisfaction with medical services costs, without many complaints about their insurances services. However, even though the treatment costs are not a problem, medical staff reported that insurance services are sometimes hampered by delays in payment.
Also, despite the positive achievement related to costs affordability, some patients were still complaining about the ffavouritism by some medical personnel of patients having to pay out pocket over those using Community Based Health Insurance membership card. Patients even claimed that sometimes those who do not have money are not tolerated.
As revealed, the problem lies in the transportation costs. This was also validated by medical staff statements when they were asked about the major financial challenges that their patients face while seeking health care. High transportation cost was the major reason along with poverty accounted for in many households.

Another observation indirectly related to planning is the visit of health center which are farther from people's residence The example highlighted was Muhima which attract people from various parts of the city more than any other health.. Among the reasons which lead to visit facilities which are not near to their home, patients claimed that they are in quest of good service, kindness of medical staff, smartness of medical staff, good infrastructure, sufficient number of personnel, allowance of ideas exchange especially in family planning, specific treatment for HIV infected patients which is not found in closest facilities, etc.
Among health centers aspects with which the population is not happy, patients have stated the lack of cleanness especially in toilet rooms and maternity rooms, the opening on time but the delay in starting to serve patients, the disappearance of medical staff during coffee break or lunch breaks and the big number of patients which prevent people to get served on time.

6.4. Main issues in health care delivery

Apart from issues described in the previous section, the results of individual dimensions of access have shown that priority has to be given to the improvement of the following indicators of access: travel time and travel time under the dimension of geographical accessibility, waiting time for consultation and for laboratory results under the dimension of accommodation, transport issues under the dimension of availability and the way information about treatment is provided along with the courteous treatment of patients under the dimension of acceptability. Considering dimensions of access as wholes, the dimension of accommodation appeared to be the most problematic based on primary data analysis.

In general, availability could not be evaluated using the same complete approach as that used for other dimension but the high satisfaction with received services has shown that people were in general happy with services. However some services users such as family planning reported high dissatisfaction and this can be linked to answers reported by medical staff. When asked about problems that are being faced in different services they stated the shortage of medical personnel specifically for Social services, nurses, sage femmes and other specialist, VCT, laboratory technicians

When asked what they think should be prioritized in the delivery of primary health care, most patients stated the improvement of services in general, the increase of the number of medical personnel in some services, improvement of clearness, improve of infrastructure and the acceptance of acceptance insurance from elsewhere and the installation of electricity for remotely located health centers (mainly in rural area).
As a general conclusion, it can be said that the main objective of this research was achieved. Access has been defined and measured in the study area using the purposive developed framework. However, this can be considered as a preliminary study. Therefore there are still a room for more research to complete it or even improve it. In this respect some recommendations are judged useful for possible future research of this kind:

6.5. Recommendations

For researchers

The study considered only a small proportion of the population composed by out patients who had almost the same characteristics and for this reason variation could not be found with respects to population characteristics. Future research should consider heterogeneous population characteristics in order to get more insight of access that could not be assessed by the present.

Also one type of health facility which is public health center was considered. In future research other types of facilities should include private providers for an adequate assessment of various aspects of access as related the health care system and users.

Within this study, some dimensions such as availability were measured using a limited number of variables compared to other dimensions investigated. For this reason, availability could not be fully measures in the same way as other dimensions. For future research the selection of indicators should allow the avoidance of such inconvenience not only for availability but also for other dimensions

Because of limited time allocated to field data collection, the spatial aspect was not emphasized on since only spatial analysis was performed for geographical accessibility and partially for availability. Thus future research should include the spatial assessment of other dimensions. The future inclusion of more secondary data in this type is also encouraged.

Field data collection for this study was not conducted by the researcher, for this reason some details might have been omitted. While conduction this type of study the researcher should be able to be on field in order to have the feeling of the reality

For health planners

The major recommendation addressed to health planners is the development of sufficient standards which can be used to evaluate various indicators of the five dimensions of access as described through this research.

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Appendix A: Empirical description of access indicators

Authors	Geographical accessibility	Availability	Affordability	Accommodation	Acceptability
(Penchansky and Thomas 1981)		Adequacy of the supply of physicians, facilities and specialized programs and services	Cost of services Insurance coverage	Appointment systems Hours of operation Walk in facilities Telephone services Clients perceptions of the appropriateness	Consumers reaction about Providers attributes 9sex, age, ethnicity, type of facility, religious affiliation of facility,
(Gulliford and Morgan 2003)		Active physicians per 100000 population Number of hospital beds per 1000	Income Insurance coverage Health care costs	Availability of appointments	
(Cromley and McLafferty 2003)	Location of healthcare Travel distance travel time Transportation means				
(Bagheri and Benwell 2005)	Travel distance Travel time		Income level Insurance coverage	Hours of operation Waiting time to the facility Application procedure	
(Obrist *et al*. 2007)	Geographical distances between services and home of intended users Means of transportation Time taken to reach health care providers	Types of services Organization offering services Skilled personnel	Direct costs of hhealth services Products delivered though services Indirect costs (transportation) Income Time lost	Opening hours in line with patients schedule Cleanness of H. facilities	Information Explanation Treatment Competence and personality of hc providers
(Wyszewianski 2002)				Hours of operation, how	age, sex, social class,

				telephone communications are handled, and the client's ability to receive care without prior appointments	and ethnicity of the provider (and of the client
(McIntyre *et al.* 2009)	(the costs of traveling to and from, and	Do people with needs for services have a means of paying for the cost of services to the provider?	Insurance coverage price of service at point of delivery cost of transportation	waiting at the health care facility)	expectations that providers will treat them respectfully, Patients' expectations about health service organization
(McCaughrin 1996)		the size of the treatment staff in relation to client demand.	indicated by income and Health insurance coverage.	appointment systems, hours of operation, walk-in capability)	

Appendix B: Patients questionnaire

MSc. Research: Evaluation of access to primary health care

Questionnaire of the patient at the Health Centre

Questionnaire NO---------- Date of interview: ----------
Interviewer name: ---------- Health centre name: ----------

Introduction

My name is ……, I am a student at the National University of Rwanda; I am involved in the research which is being conducted for study purposes. Its aim is to analyze the barriers encountered by patients in the services provided by health centers in the city of Kigali. Perceptions of patients are of immense value for a successful completion of this study and will contribute to health care services improvements. The interview will be conducted in private between the respondent and interviewer. Your responses to this questionnaire will be treated with strict confidentiality, and your names will not be mentioned anywhere, hence, your honest comments and cooperation will be highly appreciated.

We will not to keep you for long; 20 minutes are enough for the interview.

Important! Some questions are only relevant for some patients (for example it is irrelevant to ask immunization patients about the appointment with the doctor or questions about appointment if the patient didn't have any).

I. General information of the Respondent (the patient or the escorting person)

1. Residence of the patient: District ---------- Sector---------- Cell----------

2. Please fill in the table below the following information

The patient is:	Age of the respondent	**The respondent is the head oh household**	Household size (number of household members)
a)☐Woman alone b)☐Man alone c)☐Woman/man with child (the child is patient) d)☐Other, please specify----------		a)☐ Yes b)☐ No	

3. What is your highest level of education?

a)☐ No education
b)☐ I have completed only primary school
c)☐ Amshuri y'imyuga
c)☐ High school is my highest level of education
d)☐ I have completed University

What is your job? ----------

NB. If you are a farmer go to question number 7

4. Who is your employer?

a)☐ Government
b)☐ Private sector
c)☐ I am self -mployed
d)☐ I am retired
e)☐ Other, please specify ----------

5. What is your income level? (FRW)

a)☐ <10, 000
b)☐ 10,000 - 50, 0000
c)☐ 50,000 - 100, 000
d)☐ 100,000 - 200, 000
e)☐ > 200, 000

II. Questions related to the availability of services in the health center

6. What health problem brought you here today? ----------

7. In general did you encounter any service problem?

a) ☐ No problem
b) ☐ Yes I encountered (a) problem (s)

If yes, what problem?:----------

III. Questions related to attitudes of providers towards patients

8. Was the Medical staff courteous to you?

a) ☐ Much courteous
b) ☐ Moderate courteous
c) ☐ No courteous

9. Did the Medical staff take convenient time to listen to you?

a) ☐ Yes
b) ☐ No

10. Did the Medical staff provide you all the information needed?

a) ☐ Yes
b) ☐ Somehow
c) ☐ No

11. Compared to other health facilities you visited, what is the status of the cleanness in this health center?

a) ☐ Very clean
b) ☐ Moderate
c) ☐ Not clean (specify the place where cleanness is lacking) ----------

12. Are you willing to come back in this health centre in the future?

a) ☐ Yes
b) ☐ No
c) ☐ Uncertain (still thinking about it)

IV. Questions related to the organization of services in the health center

13. Are the operating hours convenient for you?

a) ☐ No
b) ☐ Yes they are convenient

If not convenient, why?

--

14. Could you estimate the time you spent waiting for consultation?

a) ☐ <10 min
b) ☐ 10 – 30min
c) ☐ 30 min - 1Hour
d) ☐ > 1hour
e) ☐ They did not receive me.

15. If you had laboratory test, how long did you wait for results? ..... Days (I think this is similar to the following)

16. Could you estimate the waiting time for results?

a) ☐ 1hour
b) ☐ Half day
c) ☐ Entire day
d) ☐ More than 1 day
e) ☐ Long time (please specify) ----------
---

17. What are other services that you waited for too long?

V. Questions related to capability to pay of services

17. What is health insurance do you have?

a)☐ I don't have health insurance, I pay on my own.
b)☐ Community health insurance
c)☐ Employer provided insurance
d)☐ Other means, please specify----------

NB. If you paid on own, go to question number 26.

18. If you have health insurance, what is the health insurance premium you pay per month/ year----------FRW

Do you have a problem with the health insurance premium?

a) ☐ No
b) ☐ Yes I have a problem

If yes, what problem? ----------

19. Do you have a problem with the services offered by the insurance you use?

a) ☐ No
b) ☐ Yes I have a problem

If yes, what problem?

Using Health insurance how much money did you pay for health services today? ----------FRW

If you pay out of pocket, how much money did you pay? ----------FRW

VI. Ibibazo bijyanye n'uburyo umurwayi agera aho yivuriza

20. Is this health center you usually use? a)☐ Yes b) ☐ No

21. What mode of transport did you use to come to this Health Centre?

a)☐ My own car
b)☐ Taxi/Bus
c)☐ Taxi voiture
d)☐ Motorbike
e)☐ Bicycle/ Motorcycle
f) ☐ Traditional transport (Ingobyi)
g)☐ Walking

22. If you paid transportation, how much money did you pay? ----------RWF

23. What do you think about the money you spent on transportation?

a) ☐ Very cheap
b) ☐ Cheap
c) ☐ Moderate
d) ☐ Expensive
e) ☐ Too expensive

(For a walking distance this question is **not applicable)**

24. Could you estimate the travel time from home to here**?**--------Hours--------Minutes

25. Could you estimate the distance you travelled from home to here? ----------Km------m

26. What do you think about the distance you traveled?

a) ☐ Ver close
b) ☐ Close
c) ☐ Far
d) ☐ Too far
e) ☐ It is too far for walking

27. Do you climb mountains / hills to come here?

a) ☐ The terrain is flat
b) ☐ The slope is not steep
c) ☐ The slope is moderately steep
d) ☐ The slope is too steep

28. Apart from this health centers, what are other health facilities that you visit?

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29. If you have others you usually use, why did you choose this one today?

a) ☐ It is the closest to my home
b) ☐ The costs of services are cheap
c) ☐ The waiting time is short
d) ☐ No shortage of drugs
f) ☐ There is medical staff specialist of my illness
g) ☐ Relationship with Medical staff who works here
h) ☐ Other reasons, please specify----------

VII. Questions related to the general appreciation of patient

30. List three positive things that you appreciate in this health center?

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31. List three negative things that you don't appreciate in this health center?

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32. What do you think should be prioritized in the improvement of health care?

Thank you very much for your cooperation!

Appendix C: Communalities of access variables

	Initial	Extraction
Topography opinions	1.000	.453
Travel distance to health center	1.000	.702
Satisfaction with travelled distance	1.000	.674
Travel time to health center	1.000	.731
Satisfaction with offered services	1.000	.470
Satisfaction with services offered by health insurance	1.000	.575
Satisfaction costs of services	1.000	.734
Transportation fare	1.000	.783
Out of pocket	1.000	.784
Income of respondents (in RWF)	1.000	.555
Satisfaction with transport fare	1.000	.734
Satisfaction with Health Center cleanness	1.000	.591
Satisfaction with Operating hours	1.000	.606
Waiting time for consultation	1.000	.915
Satisfaction with waiting time for consultation	1.000	.898
Waiting time for laboratory results	1.000	.945
Satisfaction with waiting time for laboratory results	1.000	.960
Age of the respondent	1.000	.640
Gender of respondent	1.000	.730
Education levels of respondents	1.000	.638
Satisfaction with medical staff courtesy	1.000	.724
Satisfaction with listening	1.000	.652
Satisfaction with information provision	1.000	.647

Appendix D: Access components loadings

Component Matrix										
	Component									
	1	2	3	4	5	6	7	8	9	10
Topography opinions										
Travel distance to health center			.805							
Satisfaction with travelled distance			.790							
Travel time to health center			.766							
Satisfaction with offered services	.396									
Satisfaction costs of services								.811		
Satisfaction health insurance services								.439		
Satisfaction with transport fare					.836					
Out of pocket										.870
Transportation fare					.868					
Income of respondents (RWF)						.728				
Satisfaction with Health Center cleanness				.481						
Satisfaction with Operating hours	.354									
Waiting time for consultation	.948									
Satisfaction with waiting time for consultation	.941									
Waiting time for laboratory results		.965								
Satisfaction with waiting time for results		.969								
Age of the respondent							.682			
Gender of respondent									.832	
Education levels of respondents							.759			
Satisfaction with medical staff courtesy				.817						
Satisfaction with listening				.418						
Satisfaction with information provision				.758						

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Appendix E: factor extraction

Total Variance Explained

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	3.033	13.188	13.188	3.033	13.188	13.188	2.364	10.279	10.279
2	2.349	10.213	23.401	2.349	10.213	23.401	2.062	8.967	19.246
3	1.861	8.090	31.491	1.861	8.090	31.491	1.982	8.617	27.863
4	1.686	7.330	38.821	1.686	7.330	38.821	1.792	7.791	35.654
5	1.489	6.472	45.293	1.489	6.472	45.293	1.566	6.810	42.464
6	1.290	5.608	50.901	1.290	5.608	50.901	1.496	6.506	48.970
7	1.247	5.424	56.325	1.247	5.424	56.325	1.422	6.184	55.154
8	1.100	4.783	61.109	1.100	4.783	61.109	1.187	5.162	60.316
9	1.073	4.666	65.774	1.073	4.666	65.774	1.165	5.067	65.382
10	1.011	4.395	70.170	1.011	4.395	70.170	1.101	4.787	70.170
11	.968	4.210	74.380						
12	.833	3.624	78.003						
13	.750	3.261	81.264						
14	.682	2.967	84.231						
15	.675	2.935	87.166						
16	.597	2.596	89.763						
17	.558	2.427	92.190						
18	.489	2.127	94.316						
19	.451	1.961	96.277						
20	.414	1.802	98.079						
21	.371	1.611	99.690						
22	.039	.171	99.861						
23	.032	.139	100.000						

Extraction Method: Principal Component Analysis.

Appendix F: satisfaction with received services

Needed services	Satisfaction with offered services		Total
	Satisfied	Dissatisfied	
Adult Consultation	100	21	121
	82.6%	17.4%	100.0%
CPN	27	1	28
	96.4%	3.6%	100.0%
Child consultation	51	12	63
	81.0%	19.0%	100.0%
Dressing	4	0	4
	100.0%	.0%	100.0%
Drugs	9	0	9
	100.0%	.0%	100.0%
Family Planning	8	18	26
	30.8%	69.2%	100.0%
Immunization	15	0	15
	100.0%	.0%	100.0%
Laboratory test	49	3	52
	94.2%	5.8%	100.0%
Maternity	1	0	1
	100.0%	.0%	100.0%
Minor surgery	6	0	6
	100.0%	.0%	100.0%
Missing	20	0	20
	100.0%	.0%	100.0%
Total	290	55	345
	84.1%	15.9%	100.0%

Appendix G: Population within different travel distances thresholds

Travel distance	% of population (secondary data)	% of population (empirical data)
0 –1.5km	52	27
1.5 –3km	29	38
3.5 – 4.5km	11	12
4.5 – 6km	4	10
6 –7.5km	2	4
7.5 – 9km	1	6
9 –10.5	1	3