UNIVERSITY OF THE WESTERN CAPE

Household Access to Water and Willingness to Pay in South Africa: Evidence from the 2007 General Household Survey

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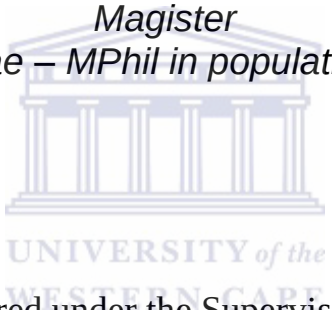

Prepared under the Supervision of
Prof. Gabriel Tati
May 2011

DECLARATION

I, **Julious Ngum Kimbung** hereby declare that this thesis ñHousehold access to water and willingness to Pay in South Africa: evidence from the 2007 General Household Surveyò, is my own work that it has not been submitted for any degree or examination at any other University or college, and that all the sources I have used or quoted have been indicated and acknowledge by complete references.

Julious Ngum Kimbung May 2011

Signed: ..... Date.....

DEDICATION

I dedicate this thesis to my grandparents; Mr Kimbung Lucas Ndong and Mrs Kimbung Sarah Teih of blessed memory and to the entire Kimbung`s family who have not spared their resources. I really wish you were here to see how big your son has grown. To my loving mum (Ngum Grace Neneh) and people who are precious in my life that I had to put aside in order to complete this dissertation such as my Dear friend and Brother Chifon Godlove Ngek and Kfu Heline Lon.

ABSTRACT

This study assesses the present level of household water access and the willingness to pay in South Africa. Although the general literature informs that progress has been made in positing South Africa above the levels found in most African countries, there are some marked inequalities among the population groups and across the provinces, with some performing well and others poorly in this regard. The study looks at the extent to which households differ in terms of water access and willingness to pay according to the province of residence. The study focuses on household heads; male and female, through different social and demographic attributes, by taking account of variables such as age, education attainment, geographic areas, and population group to name but a few. The data used in this study comes from the 2007 General Household Survey (GHS) conducted by Statistics South Africa. The scope is national and employs cross tabulation and logistic regression to establish relationships and the likelihood of living in a household with access to safe drinking water in South Africa. Results presented in this study suggest that the difference is determined by socio- demographic characteristics of each household such as age, gender, population group, level of education, employment status income, dwelling unit, dwelling ownership, living quarters,household size and income. It throws more light as to what needs to be taken into account when considering demand and supply of and priorities for water intervention from the household perspective.

Keywords: *Accessibility, Logistic Regression, Domestic Water, Demographic variables, Household, Housing, Safe drinking water, Socioeconomic variables, South Africa, Water*

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LIST OF ACRONYMS

AB - Ascending Bid

ADB- Asian Development Bank

ANC - African National Congress

BWSL - Belize Water Services Limited

CESCR - Committee on Economic, Social and Cultural Rights

CM - Choice Modelling

CSS - Central Statistical Services

CV - Contingent Valuation

DB - Descending Bid

DUs - Dwelling Units

DWAF - Department of Water Affairs

EDU1 - Lower level of education

EDU2 - Higher education

FBW Free - Free Basic Water

GHS - General Household Survey

JMP - Joint Monitoring Programme

m3 - Meter Cube

MDG - Millennium Development Goals

PPS - Probability Proportional to Size

PSUs - Primary Sampling Units

RDP - Reconstruction and Development Programme

RSA - Republic of South Africa

SANWP - South African National Water Policy

SPSS - Statistical Package for Social Sciences

Stats SA - Statistics South Africa

UN - United Nations

UNDP - United Nations Development Programme

UNESCO - United Nations Education, Scientific and Cultural Organisation

UNICEF -United Nations Children Emergency Fund

UNIFEM - United Nations Development Fund for Women

WHO - World Health Organisation

CHAPTER ONE: INTRODUCTION

This study examines the inequalities and disparities in household access to safe drinking water and willingness to pay across the nine provinces of South Africa. The main objectives of this study are to examine the differentials across the nine provinces with regards to household socio demographics and establish the relationship between household water access and willingness to pay. It makes use of the 2007 General Household Survey (GHS) data conducted by Statistics South Africa. This chapter constitute the background and the general organisation of the study.

Background to the study

Water scarcity has been identified as a major constraint to socio-economic development in South Africa (Department of Water Affairs DWAF, 2004). Though progress has been made in positing South Africa above the levels found in most African countries, there are however some marked inequalities in terms of access and quality correlating with racial groupings. Only 27% Blacks households had water as of 1999 and represented a tenth of the 12% estimated to be the household water consumption for South Africa then (William, 2009) The 2009 General Household Survey reports 26.5% of Black African population still using unsafe sources compared to only 2% of other population groups. These are aggregated figures and simply present coverage rates. It gives no idea of how these break down in terms of household demographic and socioeconomic characteristics. It is also not known how these observed differentials in access relate to the groups willingness to pay.

Kanyoka et al. (2008) contends that women have been shown to be more willing to pay than men. Surprisingly, they disproportionately travel longer distances and devote several hours each day to ensure household water security (Roy & Crow, 2004). There is no indication as to how access varies between men and women of different age groups. Crow and Farhana (2002) opine however that women make difficult choices as a result of the work involved in gaining access to water. The greater willingness to pay expressed by women is however not matched by better access to drinkable sources. This suggests an existence of barriers to safe drinking water by female headed households that has not been properly investigated.

WHO & UNICEF (2010) report 94% of the urban population in developing regions use improved water sources as against 76% in rural areas. Kanyoka, et al. (2008) notes that

domestic water uses represent 32% of water uses in South Africa. In the rural areas, it is as low as 5%. This spatial inequality was also reported by the 2009 General Household Survey among provinces in favour of the largely urbanised provinces of Gauteng and the Western Cape. Results presented in this study suggest that the difference is determined by socio-demographic characteristics of each household. What is not known however is how households across the provinces negotiate for water in terms of socio-economic and other contextual constraints. It is also not clear what factors drive these spatial differences.

Dungumaro (2007) identified household type and tenure as determinants of household water access. Elsewhere, Arrington & Jordan (1982) and Fujita, et al (2005) highlighted the following demographic and socio economic factors; age, gender, level of education, marital status, household size and expenditure, number of persons in household, and income as factors affecting willingness to pay for water services. While access is known to increases with dwelling quality, it is not clear how dwelling ownership influences household water access (Kayaga, 2003). This was a localised study and there is no indication if this is true of the entire country. Also, ownership is used as an all encompassing term without any distinction as to the dwelling type. This study examines variation in household water access and willingness to pay to determine household demographic and socio economic characteristics that account for these disparities. Finally, it establishes the relationship between household water access and willingness to pay.

Statement of the problem

Despite the enormous and concerted efforts at addressing the inequalities in water access, it continues to persist along gender and racial lines (DWAF, 2010). This is particularly pronounced in some provinces than in others and it is not clear what drives these inequalities. Most studies for example, the GHS 2009, conducted so far have examined strictly coverage paying little or no attention to household socio demographic characteristics. It is also not known how households of different characteristics negotiate for drinking water. Studies investigating the willingness to pay are rare and where they have been conducted, it has strictly been valuation studies without consideration to household demographics. Water access and willingness to pay studies have in the most part been carried out separately. Little is therefore known about the relationship between access to safe water and willingness to pay. This study examines the inequalities and disparities in household access to drinkable water and willingness to pay across the nine provinces of South Africa. It also examines the

differentials across the nine provinces with regards to household socio demographic characteristics and establishes the relationship between access and willingness to pay.

1.4 The rationale of the study

Target 10 of Goal 7 of the Millennium Development Goals (MDG) requires halving the proportion of households without sustainable access to safe drinking water and basic sanitation by 2015. This was agreed upon by delegates at the Millennium Summit held in New York in 2000. This study is an attempt to assess household access to safe drinking water and its willingness to pay in South Africa. It also aims at determining its variation across the nine provinces to determine how well South Africa is doing in meeting the MDG 7 targets and in reducing the inequality in access created by the discriminatory Apartheid policies. The WHO/UNESCO Joint Monitoring Programme (JMP) methodology is used to allow for international comparison. It also aims at providing information on the relationship between demographic and socioeconomic factors and access to water on the one hand and willingness to pay on the other. This is in an attempt to highlight the differing requirements and preferences of communities and their financial realities (Webster 1999; Nam & Son 2005).

1.5 Objectives of the study

The specific objectives of this Study are:

- To determine the different ways South African households access water and how this varies among the population groups and across the national territory.
- To determine the socio demographic factors and ways in which they affect household access to water and their willingness to pay.
- To determine the differences and patterns in households water access and willingness to pay in South Africa.
- To determine if household access to water and willingness to pay is backed by the ability to pay.
- To determine the relationship between water access and willingness to pay.

1.6 Research questions

This study addresses a general question and several specific questions.

1.6.1 General Research question

- Are there any existing relationships between access to water and willingness to pay and age, gender, population group, household income, education and labour force participation of its members, headship, house ownership, and location of household?

1.6.2 Specific Questions

This study aims to answer the following specific questions;

- In what ways does household income influence its access to water and willingness to pay?
- Does access to water and willingness to pay vary with levels of education?
- How does the gender, age and population group of a household head relate to its access and willingness to pay for water services?
- Does dwelling type and tenure (ownership) exert any influence on household access water and willingness to pay?
- How does the employment status and occupation of a household head affect its access to water and willingness to pay?
- Are there differences in access to water and willingness to pay among households across the provinces in South Africa?
- Is there a relationship between water access and willingness to pay?

1.7 Hypotheses

The following hypotheses are going to be tested in this study;

- Access to water and willingness to pay is related to income and level of education.
- Male household heads are less willing to pay for water than female household heads.
- Access to water and willingness to pay is higher in urban areas than in rural and areas.
- Access to water and willingness to pay is related to household size.
- The employed have higher levels of access and willingness to pay for water than the unemployed.
- Access to water is related to willingness to pay.

1.8 Significance of the study

This study will provide information on the different ways in which household access water, how this relates to their willingness to pay and the variation across the nine provinces in South Africa. It will inform on those factors that impact on household water access and willingness to pay and the existing relationships that need to be taken into account by governments and municipalities for intervention in the provision of water services.

1.9 Limitation of the study

The major limitation of the present study is the fact that the data used is obtained from the 2007 General Household survey (GHS). The results or findings therefore do not inform on the present levels of Access to water and willingness to pay but those that obtained in 2007.

Another limitation relating to the data is its cross sectional nature. Ideally, there would be information on peoples willingness to pay before they go to the market place looking for the good. Unfortunately, only point-in time information is available and limits the study to articulating associations only. It would have been more appropriate to use panel data to track progress made in time. This could be address in the future in other related or follow up studies when other waves of the National Income Dynamic Survey (NIDS) conducted by the Southern Africa Labour and Development Research Unit (SALDRU) becomes available. Also, it does not allow for the determination of rural urban disparities as there was no distinction between rural and urban. However, the present study though using 2007 data will provide a broad understanding of the situation which after three years most have experienced very little changes in both the demographics, and socio-economic situation of the respondents across the provinces. Another limitation to this study is the fact that the respondents were strictly household heads who in the most part are men. Women are the primary water users in every household and manage household water on daily basis. They would therefore be more informed on household water related issues than men. As a result of this the results of this study may not be a true reflection of the real situation. It is believed however that this will give an idea of the reality.

1.10 Delimitation of the study

The focus of this study is mainly to determine the present levels of household access to safe drinking water and willingness to pay for these services in South Africa. It also aims to identify household variables and determine the ways in which they affect water access and willingness to pay. Finally, this study considers the variation in household water access and willingness to pay among the different segments of society (racial groups) and across the national territory (provinces). This is not a valuation study and does not measure the amount households are willing to pay given improvements in water attributes.

1.11 Definition of key terms

1.11.1 Accessibility

Accessibility here refers to water and is the proportion of the population (total, urban, rural) with access to an improved drinking water source as their main source of drinking water. The WHO define basic access as the availability of at least 20 litres of drinking water per person per day within a distance of not more than 1km of dwelling, corresponding to a maximum water hauling round trip of 30 minutes. In South Africa, this basic water requirement that needs to be met for any household to be considered to have access to water has been set by

government at 25 litres per person per day at a walking distance of less than 200m equated to six kilo litres per household per month for a household of eight people and is provided free to every household in South Africa as stipulated by the constitution(Joshua, 2007).

1.11.2 Domestic Water

Water used, in any type of building, for domestic purposes, principally drinking, food preparation, sanitation and Hygiene. WHO defines it as water used for all usual domestic purposes including consumption, bathing and food preparation pertaining to municipal (household) water services as opposed to commercial and industrial uses. The term is sometimes used to include the commercial component (Symons et al. 2000). Domestic water is water that is delivered for normal personal use within a household, schools and commercial premises (Plumbing Working Group 2008).

1.11.3 Demographic variables

A variable is a characteristic or attribute that takes on different values on different persons. Demographic variables in this study refer therefore to attributes of individuals, sample or population. It is a varying characteristic that is a vital or demographic statistic of an individual, sample group, or population, for example, age, sex, race or population group.

1.11.4 Household

A household refers to a person living alone, or a group of people (not necessarily related) living at the same house or dwelling unit with common housekeeping - sharing either a living room or sitting room, or at least one meal a day. A household is a group of persons who live together, and provide themselves jointly with food and/or other essentials for living, or a single person who lives alone. The definition of household used for other Stats SA data collection operations includes the four-night rule, according to which a person is a member of a household if he spends an average of four nights a week in that household. Census 2001 for example was a de facto census, which means that people were counted where they were staying on census night; the four-night rule did not apply.

1.11.5 Housing Unit

Housing here is considered to be any form of dwelling, be it single or shared, urban or rural providing shelter to either an individual or a group of persons. It is therefore any structure that serves as a dwelling place either for a single person or group of people. Census 2001 defined it as a unit of accommodation for a household, which may consist of one structure,

more than one structure, or part of a structure. Examples of each are a house, a group of rondavels, and a flat.

1.11.6 Safe drinking water

Drinking water is defined as water for ingestion, basic personal and domestic hygiene and cooking. It excludes water for domestic laundry, an activity that frequently happens at the source, water point, in rivers and streams. An improved drinking water source is defined as a type of drinking water facility or water delivery point that by the nature of its design protects the drinking water source from external contamination, particularly faecal origin and includes; piped water into dwelling, plot or yard, public standpipe/public tap, protected dug well, protected spring, and rain water

1.11.7 Socioeconomic variables

It is varying characteristic that is, a vital or socio economic statistic of an individual, sample group, or population. The variables used in this study are age, gender, population group (self reported), income (measured at individual level and includes any financial earnings other than salary which is considered separately), employment status, occupation, living quaters,dwelling type and ownership, water source and distant to water source).

1.11.8 South Africa

The Republic of South Africa is a country located at the southern tip of Africa, with a 2,798 kilometres (1,739 miles) coastline on the Atlantic and Indian Oceans. To the north lie Namibia, Botswana and Zimbabwe; to the east are Mozambique and Swaziland; while Lesotho is an independent country wholly surrounded by South African territory. South Africa is a nation of about 48 million people of diverse origins, cultures, languages, and religions made up of Black Africans (79.3%),Whites (9.1%), Coloureds (9.0%), and Indian or Asian (2.6%) as shown by the 2009 midyear estimated figures (Statistics South Africa).

1.11.9 Water

Water covers 71% of the Earth's surface. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapour, clouds (form of solid and liquid water particles suspended in air), and precipitation. Oceans hold 97% of surface water, glaciers and polar ice caps 2.4%, and other land surface water such as rivers, lakes and ponds 0.6%. A very small amount of the Earth's water is contained within biological bodies and manufactured products. Clean, fresh drinking water which is the subject of this study is essential to human and other life forms. In South Africa domestic water uses constitute 32% in urban and as low as 5% in the rural areas.

1.12 Organization of the study

This study is subdivided into five chapters. Chapter one provides the background to the study, the statement of the problem, objectives, research questions, hypothesis and the significance of the study. Keywords used in the study are defined and thesis outline defined here. Chapter two is a review of relevant literature on the research area. This will be done with the following guiding order: socio political issues around water access, public versus private water supply, access to domestic water as a human right, water access, WTP and will conclude with the conceptual framework which will be used for analysis. Chapter three explains the research design, methodology and data collection process. Chapter four presents the results of the data analysis. Chapter five discusses the findings presented in chapter four. The final chapter (six) draws some conclusions from the results and discusses policy implications and makes recommendations for future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on water access and willingness to pay under two major headings; water access and willingness to pay. It begins with a consideration of policy issues; present and past around water access in South Africa and the world at large. Public and private water supply is discussed and the ongoing debate on peopleôs right to safe drinking water presented. Finally, it examines the factors affecting access to water and willingness to pay at the household level. The review provides basis for the conceptual framework outlined in the last section of this chapter.

2.2 Socio political issues around water access

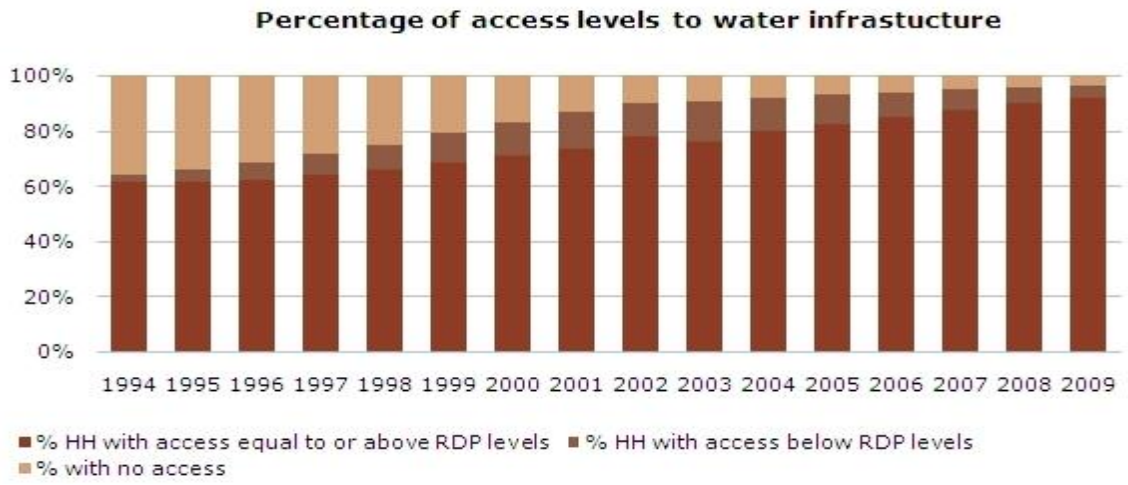
The United Nations (UN) has identified Access to sufficient clean water as key to the attainment of the Millennium Development Goals (MDG) relating to health, sanitation, poverty alleviation and meaningful and sustainable development (Target 10 Goal 7). Regrettably, many people around the world mostly in developing countries still lack access to safe drinking water.The situation in South Africa is particularly interesting given its long history of gross unequal distribution of basic services. The Black population was significantly excluded from every aspect of public life including service provision (Rose, 2005). Access to water provides a clear example of the unequal service distribution developed under apartheid, with levels of supply correlating with racial groupings (Goldblatt, 1999). Services including domestic water were extremely polarized between white and black areas. Lack of access by the poor is attributed to the Afrikaner monopoly on land ownership. Rose (2005), concerts that water policy under the Apartheid government was anything but equitable. Blacks were compulsorily displaced from valuable land to dry, rural regions in which there was scant access to water resources.

The fall of the Apartheid regime in 1994 was very much welcome; more so by the majority Black who hitherto were oppressed and deprived of basic services. Only 27% Black households had water as of 1999 and represented a tenth of the 12% estimated to be the household water consumption for South Africa then (William, 2009). In an attempt to correct these imbalances, new policies that promoted equality and human dignity were adopted by the new regime. This culminated in the entrenchment of the fundamental human rights in the constitution in 1996 (De Visser et al, 2003). The 1997 Water Service Act and the 1998 water Act enacted by parliament under this constitution provides the legislative framework for

water services and water resource management respectively (William, 2009; Kanyoka, et al. 2008). This led to the adoption of the South African National Water Policy (SANWP) making it the first country in the world where peopleôs right to water is guaranteed by the constitution (Visser et al, 2003). In May 2001 the Department of Water Affairs (DWAF) formerly translated into government policy an African National Congress (ANC) election proposal that provides for a basic level of water supply set at 25 litres per person per day (25l/p/d) at a walking distance of less than 200m as specified in Reconstruction and Development Programme (RDP) (DWAF, 1994) regulated by the national strategy in terms of the water Act (108 of 1997) (RSA) and supplied free by government through the municipalities (De Visser et al, 2003).

Statistics from the DWAF show that remarkable progress has been made in water provision since the demise of the apartheid regime. Access to water in urban areas has risen from 70.3% to as high as 94.8% and in the rural areas; these figures are put at 44.4% and 78.7% for 1994 and 2008 respectively. Figure 1 shows that the proportions accessing water below RDP levels and those with no access have reduced dramatically since 1994. Those accessing this resource at or above RDP levels have increased from slightly over 60% to almost 95% in 2009. What is not known is how this varies across the provinces and between the different population groups.

Figure 1: Levels of access to water supply infrastructure



Source: Census 1991, 1996, 2001; Department of Water Affairs and Forestry (DWAF, 2010)

The significant progress made in providing water to South African households is not synonymous to fair and equitable access. Many households mostly in townships and informal

settlements are still in dire need of sufficient safe drinking water. Examining the water allocation reform, Movik, (2009: page 3) contends that ñthose 300 years of turbulent history takes time to remedyò. Barlow and Clarke (2002) in concurrence opined that not only is water is at the heart of every fight in this country but it is deeply politicised. The recent wave of service delivery protests throughout the country attest to this. It brings to the fore the struggles of those, who being deprived of their basic right to water have decided to fight back.

2.3 Private and public water supply

Water provision is deemed to be a core element of social contract between the state and its populace (Mustafa and Reeder, 2009). Governments through most of the twentieth century and in many countries have been the sole player in this sector. The situation however is beginning to change with many opting for privatisation to ensure full cost recovery, better services and sustainability. Privatisation is a World Bank inspired program aim at mobilising private finance to ease the pressure on fiscal scarce resources or public funds. Privatization on paper can be very deceptive. While public utilities prioritise increase water accessibility to the poor, their private counterparts are more concerned about profit. More than 100,000 people in Kwazulu-Natal province became ill with cholera after water and sanitation services to local communities were cut off for non-payment (Barlow and Clarke, 2002).

Poverty is used to justify non payment of water services and disparities in access to safe drinking water (Komives, et al, 2005). It is also the basis for the highly contested subsidisation of utilities and utility customers by governments. Utility subsidies are a component of a broader social policy agenda which include the redistribution of resources towards the poor. The argument is that poor households would be unable to access water if subsidies were not offered. Komives, et al. (2005) agree that subsidies generally reduce water prices but questions its ability to target poor households. Paradoxically, those most often connected to this highly subsidized system are more affluent people, while the poor rely on either expensive private sellers or unsafe sources (Franceys, 1993; UNDP, 1998). Christmas and de Rooy (1990) observed that 70 to 80% of these funds go to serve 20 ï 30% of the population, mostly the rich.

Proponents of privatisation on their part argue that subsidies work against improvement of services to existing customers and the extension to unconnected households. Komives, et al, (2005) contends that subsidies result is an inefficient use of resources and results in a

consequent indirect raise in the cost of service provision. Komives, et al, (2005) further states that, the costs of subsidies in terms of inefficiency may rival or exceed any benefit derived from its provision. Contesting this view, Barlow and Clarke (2002) note that, the provision and improvement of water and other basic services in most developing countries constitute election agenda. Disengagement of the government would be a political failure; more so as privatization does not take care of the social dimension of water.

Mustafa and Reeder, (2009) reporting on a survey conducted in Belize City, Belize contest the claim that privatisation improves services and expand water networks. Belize Water Services Limited (BWSL), incorporated by the Anglo-Dutch multinational Biwater (CASCAL BV) claimed to have invested BZ $40 during the first three years of operations. Most of it in completing projects left by its predecessor buts its customer base had not changed. This led to Belize breaking ties with its parent company CASCAL BV in 2005. Elsewhere in Tanzania, Biwater (CASCAL BV) was also kicked out just two years into its ten year contract (WDM, 2005 in Mustafa and Reeder, 2009). It was making less than half of the investment and had failed to improve services in Dar es Salaam. It had made just $4.1 million of the $8.5 million investment expected for the first two years. The termination of these contracts however could be very controversial. There was not enough time (2 years in Tanzania) for any substantial improvement. Again, no idea has been given as to the state of affairs at the time they took over.

Public perception of the quality of service and water as well as access to safe water and affordability under the private company (BSWL) was also a subject of study. Results show that, 54% of the 225 respondents perceived water to be safer, 44% unsafe and a minute 2% did not have access to piped water of any sort. The study also revealed that 31% had better access than before, while 42% said it had not changed and 27% said that it was worse. When asked about the quality of the water, 17% said it had improved, 55% said it had not changed while 29% said it was worse. Findings on affordability of water under the new provider show that 84% said it was less affordable, 5% more and 11% said it had remained the same. Overall, 12% reported water bills of more than a third of their household income. This is higher than the standard set according to international research between 2% and 7% (Baroudy et al, 2005 in Mustafa & Reeder (2009).

It would be inappropriate to make any conclusive statement using these two cases. What is clear however that is, the capacity of private companies to efficiently manage water utilities and provide affordable and better services is questionable. Gassner, et al, (2009) acknowledges the difficulty in determining whether privately manage utilities out perform their public counterparts. The point advanced is that there are most often natural monopolies and do not operate in a competitive market. Literature informs that services provided by private utilities have features traditionally used to justify public involvement rather than characterising a competitive market.

2.4 Domestic water as a human right

People`s perception of water differ significantly from one society to another as a result of differences in culture and tradition. The Former United nations Secretary General Kofi Annan once said that, ñaccess to water is a fundamental human need and therefore a basic human rightò (WaterAid, 2003; Rights and Humanity, 2010). The debate surrounding peopleôs right to water is complex. The bone of contention here is its consideration as a basic human right. The UN Committee on Economic, Social and Cultural Rights (CESCR) meeting on 26 November 2002 issued a declaration recognising access to water is a human right. This also recognises water as a public commodity fundamental to life and health. Included here is the right to sufficient, affordable, physically accessible, safe and acceptable water for personal and domestic uses. Raja, (2002) opined that these rights contain both freedom and entitlement. Emphasis is on the treatment of water as a social and cultural good, rather than an economic commodity (Jayyousi, 2007).

The fundamentality of water to life is undeniable but its consideration as a basic human right is debatable chiefly because it is not stated as such in the Universal Declaration of Human Rights. The Convention on the Elimination of all Forms of Discrimination against Women, the Convention on the Rights of the Child, and the African Charter on the Rights and Welfare of the Child have this well stated. The Geneva Conventions also guarantee the protection of this right during armed conflict (Water Treaty). The International Bill of Human Rights stipulates that ñin no case may a people be deprived of its own means of subsistence.ò Raja, (2002) argues that this right cannot be realized without access to water.

Signatories to these treaties have not only the obligation of respecting this right but of incorporating them into national laws and policies. South Africa so far is the only country where the right to water is constitutional (De Visser et al, 2003). Non enforcement of this treaty is largely owed to the absence of an internationally binding document that compels

signatories to do so (World Water Forum, 2009). CESCR's General Comment 15 recommends that Water be treated as a social and cultural good, a public good, and not primarily as an economic good. It further recommends that any payment for water services be based on equity, ensuring that services, whether privately or publicly provided, are affordable to all (Water Treaty).

The reluctance of governments in recognising the right to water is attributed to afore mentioned reasons. Recognising the right to water is tantamount to accepting to provide free water for all or at least subsidising water prices to a basic minimum. The implication of this is twofold. Firstly, the inability to tap and use finances from private sources and secondly, the burden it would placed on fiscal scarce resources. The right to water however has not been clearly defined neither has it been expressly recognised as a Human right. It is only being interpreted as being an implicit component of the existing fundamental human right (Scanlon, et al. 2004).

The literature on the history, politics and legal issues around water access in South Africa reviewed above help to situate the preceding sections in context. The proceeding literature considers the impact of household socio demographic variables on access and willingness to pay for water services.

2.5 Household Water access

2.5.1 Water source and quality

Different communities access water differently. The difference is both in terms of the sources and quality of water accessed. The multiple ways in which householdôs access water is a direct reflection of their characteristics and socio- economic conditions. Using data from a study conducted by the Palmer Development Group (PDG) and from the Central Statistical Services (CSS, 1996, 1997), and 1995 October Household Survey (OHS) to assess urban water supply, Goldblatt, (1999) reported that approximately 4.9 million people living in urban South Africa had a minimal level of water supply. An additional 4.4 million urban residents had access to basic water supply and 2.3 million in households had an intermediate level of a yard tap and 15.5 million with a full in-house connection.

Using the 1995 OHS the same study indicated that 98.8% of white urban residents had a house connection while only 56.1% of Africans in urban areas had this full level of service. Amongst the urban African population approximately 40% of households had a site

connection, while about 8% had access to water solely through communal supplies. In cases where water had to be fetched, 8.5% of urban households had to collect water at a distance greater than 200m from their dwelling. Of the other households without an on-site connection, 9.4% had a water source at a distance of between 100 and 200 m, while the remaining 82.1% had a water source within 100m of the house (Goldblatt, 1999). This study was limited to piped borne water and is therefore not exhaustive of the water sources accessed by South African households.

Adekalu et al. (2002) reporting on a study of four cities in Nigeria made mention of other sources not considered by Goldblatt, (1999). Table 2.2 shows the proportion of households accessing the various water sources in the cities studied.

Table 2.1 Percentage of people with different water sources

	Tap Water	Borehole	Ordinary well	Public Tap	Water Hawker	Rain Water	Storage tank
Lagos	42.1	38.1	39.2	56.7	54.2	21.4	72.8
Ibadan	23.6	26.1	65.1	47.6	66.6	68.5	61.6
Ife	27.1	15.8	74.7	88.4	35.9	66.5	27.1
Ilesa	14.7	15.6	75.0	11.6	11.4	97.3	28.2

Source: Adekalu et al, (2002)

The statistics presented reveals that very few people (less than 30%) had a private piped water connection except for Lagos, and about 42% were connected to piped water systems. The majority relied on open and deep wells and public taps to supplement their tap water connection due to irregularity in water supply. Most homes had their own shallow wells and some depended on the wells in neighbouring homes. In Ilesa, rain harvesting was found to be a very common practice probably because of lack of access to piped water. A sizeable number of households (about 50%) had storage tanks of varying capacities for storing water (Adekalu, et al. 2002). Not all the sources mentioned here were used for drinking purposes. Water use is a function of householdôs perception of water quality. Crow and Farhana, (2002) observed that a household`s water source depended on availability, proximity and purpose of use. Aiga and Umenai, (2002) reported that rain water was used principally for washing in the squatters of Manila. In Nigeria, Adekalu, et al, (2002) found that where residents perceived rainwater as safe and of good quality it was collected and used for drinking.

Household water sources are also known to vary with time (seasons) especially in areas where access is problematic. In the four Nigerian city study, Adekalu, et al, (2002) observed that rain and well water use was predominant in the rainy season and not in the dry season. Households resorted to fetching water from neighbouring houses with deeper wells or buying water from hawkers due to the absence of rain that had led to the drying up of wells; a problem further compounded by the irregularity of tap water in the dry season. Evident here is the fact that water use is not just a function of its perception and season but also of available water sources. Literature informs that the main source of drinking water is the piped borne water. Rain and well water is used mainly for washing purposes. Adekalu, et al (2001) reported that only 18% of the households in Lagos perceived rain water as poor. In Ibadan, Ife and Ilesa, 25%, 30% and 40% respectively of the households used rainwater as their primary source for drinking and cooking. These are alternative sources and the use is circumstantial. It happens only where access to piped water is poor, irregular and unreliable. A generalization would be an over statement. It however suggests that household main source of water is a function of the available sources.

Costa et al, (2009) contends that improvement in water access and quality leads not only to an increase in the amount of water demanded by households but also to a proportionate decrease in the expenditure and collection time. In a two location study conducted in a squatter area of Manila, time spent to fetch water in LE reduced considerably from the average 4.7h waiting time after a direct private water connection and meter was distributed to every housing unit (Aiga & Umenai, 2002). Water consumption in LE was found not only to be significantly higher but its frequency was more widely distributed. The householdôs expenditure on water in LE had fallen and income increased significantly in LE compared to that in MA that did not receive this treatment.

Improved water access leads a general improvement in household condition. As water collection time reduces due to improved access, household members who hitherto were responsible for fetching water are relieved of this duty. They are able to either take up gainful employment or start an income generating activity resulting in an increase in household labour force participation and a consequential rise in household income. Improved access also mean avoidance of higher prices charged by owners of public water faucets. This cuts down expenditure and makes available more resources in the household (Aiga and Umenai,

2002). It is evident therefore that improved access leads to increase in water use due to affordability and reduction in collection time. It is not clear however if this would be the case if improvement was as a result of privatisation as privately run utilities have a policy of full cost recovery that could lead to even higher water prices.

2.5.2 Water access, gender and age

A socioeconomic study of the differentials and availability of domestic water in South Africa indicated that gender is not a very strong predictor of household water access (Dungumaro, 2007). Results portray that female headed households are poorer than their male counterparts hence limiting their access to water. The point here is that water access is more a socio political than an economic issue. Its availability in a household is not highly influenced by age and sex as do other householdvariables. Crow and Farhana, (2002) opined that there are gender inequalities in water access for drinking and cooking. A view concurred by Crow & Sultana, (2002) as well as Roy & Crow, (2004). Crow and Farhana, (2002) further observed that the divergent social positions of men and women in the global south lead to differences in water access and use. Women and girls disproportionately devote several hours each day to ensure household water security.

Customarily, the responsibility of water collection for domestic use befalls women. Collection of water is a major part of women`s work in the global South (Crow and Farhana, 2002). Inadequacy or poor water access entails need for alternative water sources. This could not only be time consuming but physically demanding as well. Highlighting women`s role, United Nations Development Fund for Women (UNIFEM) observed that they are most often responsible for domestic and community water management in developing societies. They are charged with determining water sources, quantity and hygienic quality. It further pointed that when access is restricted due to distance, time constraints or economic factors, women are not only are obliged to accept lower-quality water but also restrict their water use. Crow and Sultana, (2002) in agreement stated that these difficult choices are made as a result of the work involve in gaining access to water and also in order that children; who most often help their mothers in water collection, may be kept safe and allowed time for other household chores.

Results of studies conducted in Manila and Botswana are in contrast to the general consensus that women are solely responsible for water collection in the household (Aiga & Umenai, 2002; Mazvimav & Mmopelwa, 2006). Accounting for the deviation observe in Botswana,

Mazvimav & Mmopelwa, (2006) stated that water sources are distant from the homesteads and donkey carts used to transport water are traditionally driven by men. In Manila, collecting water was not only physically stressful but time consuming (4.7 h, from 8 AM to 12:40 PM queuing); a job that could be better done by men (Aiga & Umenai, 2002). Although women are the main water users in the household, its collection does not solely befall them. They are aided by men and children and the help they get depends on the distance to the source, means of collection and transportation thereof.

It has been reported that in South Africa, women collectively walk the equivalent distance of 16 times to the moon and back per day gathering water for their families (UNIFEM). A study conducted in Mozambique indicated that a reduction in the length of the water collection journey from five hours to 10 minutes was associated with an increase in average water consumption from 4.1 to 11.1 litres per person per day. Water used for food preparation also increased. Cairncrossa and Cliff, (1987) suggested that scarcity of water may also influence peoples diet. According to Arouna & Dabbert (2009) the expectation is that better accessibility will positively affect the quantity of water consumption. Findings show that more than half the time saved as a result of improved water access was spent on other household tasks, particularly grinding cereals, doing other productive work and much of the remainder was spent with their children and leisure. This is consistent with the impact assessment report by Asian Development Bank ADB (2009) which revealed that improve water access significantly improved high school attendance of the girls in middle socioeconomic group, and increased leisure time for female members of the household.

Investigating children`s access to safe water in South Africa, Leatt and Berry (2004) reported that there were some 7.7 million children (43%) whose families relied on unsafe or distant water sources across South Africa. There was found to be a significant racial bias in the distribution of adequate water as 99% of children without access to water on site were Black (Leatt and Berry, 2004). A reasonable variation was found across the provinces with some areas performing well in delivering water to children. 90% or more of the child populations in the provinces of Free State, Gauteng, Northern Cape and Western Cape were able to access drinking water on site. In contrast, more than half the children in other areas were exposed to unsafe drinking water sources with Eastern Cape having over 2 million (68%), Limpopo 1.7 million (68%) and over 2 million (53%) in Kwazulu-Natal living under such conditions.

The effect of poor access to safe water on children is far reaching. Water Aid, (1999) opined that it impacts directly on their personal development affecting profoundly their health, education and relationships. It further stated that poor access leads to low enrolment rates and absenteeism in schools especially for young women and girls who may be kept away from school to undertake the time-consuming daily task of water collection. Crow and Sultana, (2002) observed that these children frequently fall sick of water related diseases that keep them away from school. Burrows, (2004) stressed that the affected children are the worldôs poorest being denied an education that could help their families and communities out of terrible poverty.

Table 2.3 Absolute and relative frequency of children living in households with adequate water in South Africa in 2004

Province	Adequate		Inadequate		Total
	Number	%	Number	%	Number
Eastern Cape	782,685	24	2,433,162	76	3,215,847
Free State	902,396	85	161,446	15	1,063,842
Gauteng	2,435,458	92	206,278	8	2,641,736
KwaZulu-Natal	1,608,636	42	2,183,739	58	3,792,375
Limpopo	1,047,299	40	1,568,307	60	2,615,606
Mpumalanga	877,356	67	430,509	33	1,307,865
Northern Cape	307,641	91	29,551	9	337,192
North West	841,374	57	647,272	43	1,488,646
Western Cape	1,456,965	93	101,743	7	1,558,708
South Africa	**10,259,810**	**57**	**7,762,007**	**43**	**8,021,817**

Source: Leatt and Berry (2004)

2.5.3 Housing tenure and water access

Dungumaro (2007) identified house type and tenure as strong determinants of water access to any HH. Water access is directly linked to housing and formal ownership is key to household water connections. Evidence emerging from the study carried out by Dungumaro (2007) showed that access to safe water increases with quality of the dwelling unit. The better the dwelling unit, greater were chances of the household accessing safe drinking water. Traditional dwellings scored a low of 1.1 % in obtaining piped water in dwelling and was highest (30.7%) followed only by the back yard (8.3%) in obtaining water from stream or flowing water sources. This dwelling type was also ranked first with a percentage score of 2.5% for obtaining water from pool or stagnant source.

Evident from the results presented by Dungumaro (2007) is the variability of water access with housing type. It however, cannot be used as a determinant of water access in a household in isolation. The type of dwelling unit is itself determined by a combination of many other factors. Literature seems to agree as to the influence tenure status plays in household water access, but so far, the strength and direction of the existing relationship has not been clearly demonstrated.

Table 2.4 Water sources by main type of dwelling unit

Water source	Main dwelling							
	House or brick stand alone structure	Traditional dwelling unit	Flat/apartment	Town/cluster/ semi-detached house	Unit in retirement	Dwelling in the back yard	Informal dwelling	Total
Piped tap in dwelling	49.6	1.1	75.4	78.5	96.8	22.2	7.7	39.2
Piped tap on site	27.3	12.3	18.8	16.9	1.6	39.9	66.1	29.8
Neighbors tap	1.9	3.2	0.5	0.0	0.0	1.4	6.1	2.6
Borehole on site	2.0	0.6	0.2	0.4	0.0	1.1	0.4	1.4
Rain water tank on	0.7	1.4	0.4	0.0	0.0	1.3	0.1	0.7
Public tap	9.9	22.9	1.8	1.5	0.0	10.0	15.2	12.9
Water carrier	0.5	1.3	0.2	1.0	0.0	0.6	0.8	0.7
Borehole on site	2.8	6.9	0.7	0.6	0.0	3.4	1.1	2.9
Flowing water/stream	2.5	30.7	1.7	1.0	1.6	8.3	2.0	5.4
Pool/stagnant water	0.6	2.5	0.1	0.0	0.0	0.9	0.1	0.8
Well	1.3	6.1	0.1	0.0	0.0	0.3	0.0	1.5
Spring	0.6	10.4	0.2	0.0	0.0	10.7	0.0	1.8
Other	0.2	0.5	0.1	0.2	0.0	0.0	0.3	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Adapted from Dungumaro, E. W, (2007)

2.5.4 Access to water and household income

According to Garcia (2005) water is not only a social but an economic good and therefore must be valued. Its availability in a household entails some cost to the household. The ability to pay is determined by the household income (a measure of household wealth) itself a function of the labour force participation. Using the generic term poverty as a proxy for lack of resources or low income, Soares, et al. (2002) relates it to householdôs water access. Sullivan (2002) affirmed this stating that income is a strong predictor of availability of water in a household. Research has revealed that in many settings it is the poorest of households who pay the most for such services (Zaroff & Okun 1984; Whittington et al. 1991 in Davis et

al.2008). A poor family may indeed spend, over the course of a month, an amount exceeding that needed to obtain water network services. Whittington et al, (1999) however observed that such a family often manages funds on a day-to-day basis and would find it difficult to save money to pay a monthly or bi-monthly utility bill.

Cairncross & Cliff (1987) pointed to the fact that, the classification of a household as poor is a function of its resources (income); a determinant factor of the household`s access to safe drinking water. Poor households is known to have poor access to safe water. They access mainly public taps or other distant sources where they queue up waiting for their turn to collect water. Aiga & Umenai (2002); and Mazvimavi & Mmopelwa (2006) in concurrence stated that accessing water takes up time that could be used in generating income for the household thereby worsening its situation. According to Cairncross & Cliff, (1987) it does not only limit their household's water use, but forces these householdss to resort unsafe sources like wells, boreholes and rain water.

In the two cases studied by Aiga & Umenai (2002) and Mazvimavi & Mmopelwa(2006), men who constituted the labour force were found to be responsible for water collection and not gainfully employed as time that could be used working to earn some income was used to collect water for the households. The effect of this was a reduction in households labour force participation and a consequential reduction in household income that impacted negatively on its water. Impact studies conducted after improving access in Manila showed an increase in household labour force participation (Aiga & Umenai, 2002). Households members hitherto charged with water collection had gain employment leading improvement in the household's conditions. Household water consumption was also found to have increased because households had become more able to pay their water bills as a result of the increase in household income. Justifying this increase, Snowball, et al, (2008) stated that direct connections eliminated not only the collection time but also the extra charges on water in the form of commissions charge by private water providers.

Higher income households on their part have relatively better and easier access to safe water. Most often, these household have their water connected directly into the dwelling unit or at most in the yard. This means that time is not wasted in water collection. The results of a study conducted in South Africa by Dungumaro, (2007) indicated that respondents with salaries or wages as their main source of income obtain had piped water connected into the dwelling

(48.4%) whereas those who depend on remittances scored lowest in this category (15.7%). Those with salaries and wages as main sources of income scored the lowest for drawing water from well (0.5%) and spring (0.9%). Investigating for time spent collecting water, households which depended on remittances were found to spend more time to water source as opposed to other categories. Disturbing however was the observation that those with no income were able to obtain water within 0ï 14 minutes. Though strange, it is very possible in South Africa where the government is committed to provide a basic level of water free to every citizen. Since only water consumption in excess of this is paid for, it is possible that these households had limited their consumption to this and did not have to pay for water.

2.5.5 Occupation, employment status and water access

Dungumaro (2007) explained household access to water in terms of occupation and employment status of head of household and its labour force participation. Results suggest that female household heads tend to be only workers in their households as opposed to male household heads who in most part work formally. It suggested that the economic status of these female household heads is likely to be comparatively low while their household sizes are larger impacting household members negatively. Evident therefore is the fact that employment status of a household head and the labour force participation of household members directly influences its income and hence its ability to access safe water. Households headed by the employed with higher labour force participation would have better access than those headed by the unemployed with lower levels of labour force participation.

2.5.6 Water access and education

Using the number of adults who had completed primary education in the household as a proxy for education level, Arouna & Dabbert, (2009) reported that water access was positively affected by the level of education. This is in line with general consensus in the literature and concurred by Harapap & Hartono, (2007) & Gerlachi & Franceys, (2009). Harapap & Hartono, (2007) identified bread winnerôs educational background as one of the factors that significantly influence the availability of piped water in a household. According to Gerlachi & Franceys, (2009), education raises the demand for domestic piped water connection. The explanation here is that, as the level of education increases among household members, the level of awareness about the health benefits of water use also increases.

Education like water is an economic good and obtaining quality education depends very much on the ability to pay. While the perception of water quality is known to vary according

with level of education attained with the highly educated going for relatively safer water sources, education also opens up doors to jobs and high earning opportunities leading to a rise in household income and hence easier access to safe water. Writing on the effects of poor water access on poor children`s education, Burrows (2004) opine, ñthese children are the worldôs poorest being denied an education that could help their families and their communities out of terrible poverty.ò Poverty therefore limits access to safe water and quality education which impacts negatively on income (earning opportunities) leading yet to poverty and inability to access safe water sources; a circle that uneducated poor and unable to obtain safe domestic water.

2.5.7 Household structure and water access

HH poverty and water access has been linked to its size. Weeks (2005) documented that household size is closely associated to its socioeconomic status and its memberôs prospects in life. Dungumaro, (2007) commenting on trends in literature stated that the bigger the size of a households, the poorer it is and the more difficult it becomes for it to access safe. In this study, differences in the size of households headed by men and women were observed. Male headed households were of size of 3.6 and 3.7 for female headed households. This suggests that female headed households are likely to be larger and poorer than male headed households. This assertion would be true in households with high dependency ratios and low labour force participation. In the same study Dungumaro, (2007) observed that 10.1% female headed households had three children while male headed households had 7.3% .Evident here is the relatively higher dependency ratio for female headed households.

Contrary to Dungumaro, (2007), larger households made up of adults with high labour force participation would be expected to have higher incomes and better access to safe water. Aiga & Umenai (2002) reporting on the impact of improvement of water supply on householdseconomy in a squatter area of Manila showed that with improved water access, household members were able to gain employment. This led to a considerable improvement in the household condition, income and a consequential improvement in water access and use.

Investigating household composition, Dungumaro, (2007) found that 19.1 % female headed households had one elderly person as opposed to only 7.9% male headed households. The higher proportion of the elderly is an indication of high dependency in these households. This coupled with the fact that female household heads tend to work only in their households with

members showing very low levels of labour force participation make further compromise their chances of accessing safe water sources.

2.5.8 Rural and urban water access

World Bank, (2004) reported a great disparity in the urban and rural households`ô water access with the urban showing higher levels of access than the rural areas. Reports by WHO & UNICEF, (2010) revealed that the rural population without access to an improved drinking water source is over five times greater than that in urban areas. It further stressed that these disparities are particularly striking in Sub-Saharan Africa. According to the report, 94% of the urban population of developing regions used improved sources, while only 76% of rural populations had access to it. Statistics by the Central Statistical Office Zambia, (2006) showed a significant difference in water access between the urban and rural areas. Access to safe water was found to be higher in urban (89%) than in rural areas (43%) with Lusaka Province having the highest proportion of households with access to safe water (96%) while the Northern Province recorded the lowest proportion (16%).

Comparing groups with similar income levels, Soares, et al. (2002) found that, the population living in rural areas had a smaller proportion of households with a piped water supply. Even among the wealthiest 10% of the rural population, the proportion of dwellings with a household water supply was smaller than in the poorer deciles of the urban population. The explanation to the observed differences was the fact that rural areas were not prioritized by the water supply programs and in the social and political agendas, lack of specific sector policies and subsidies, and the higher costs of installing a drinking water supply infrastructure in areas with low population density. It could also be due to failure to draw the attention of national authorities and public investment funds (Soares, et al. (2002). Worthy to note here is the diverse sources of water in the rural areas that compete with improved water.

2.6 Household willingness to pay for water services

Olajuyigbe and J.O. Fasakin (2010) argued that if something is worth having, then it should be worth paying for. Water definitely is one of those things worth having given its importance to life. It needs not only be accessible in quantity and quality but also sustainable to ensure future access. The provision of this valuable resource entails heavy investment and someone would have to provide these funds. Governments hitherto have had to pay for this through public water utilities and consumers either getting water free or charged a minimal fee thanks to subsidies provided to these utility companies. With the privatization, water utilities are now implementing the policy of full cost recovery and customers are increasingly being charged for water services.

It becomes necessary to know not only households as well as individual willingness to pay and their ability to pay but also to identify those factors that impact on householdôs willingness to pay. willingness to pay studies most often are conducted by means of choice modelling (CM) and contingent valuation (CV) using either ascending bid (AB) or the descending bid (DB). Writing on factors affecting willingness to pay for water services, Arrington & Jordan (1982) and Fujita, et al (2005) identified the following demographic and socio economic factors; age, gender, level of education, marital status, household size and expenditure, number of persons in household, and income. Arrington & Jordan (1982) argued that entering demographics in the design of different levels of services for different demographic groups will ease the estimation of equity impacts across demographic groups and forecast the impact of changes in demographics. It emphasised that including demographics would result in a more accurate distribution of willingness to pay.

2.6.1 Household water source, quality, use and willingness to pay

The general trend in literature suggest a relationship between water source, and peoples willingness to pay for water services (Snowball et al. 2008; Casey et al. 2006; Gerlachi & Franceys, 2009; Raje, et al. 2002; Kanyoka et al. 2008; Mirajul, et al. 2008). Research results reported by Farolfi et al. (2007) revealed that source of water was statistically significant and negatively correlated to willingness to pay. This is an indication that as the usersô appreciation of water quality increases their willingness to pay declines. Kanyoka, et al (2008) in a study conducted in the Sokeroro-Lesalo area showed that different groups of households had different preferences for improvement in water services and different willingness to pay for different improvements in water services. This was attributed to variation in the available water sources. The results revealed that access to water from a

private tap is a very important improvement to households without private taps whilst purification of water to improve quality was the most important for households with private taps. This is in consistent with research findings by Altaf, (1997) and concurred by Litllefair, (1998). Whilst results indicated an overall willingness to pay, what seemed apparent was the fact that there are two different types of willingness to pay; the amount the villages were willing to pay for their traditional source of water (wells) and the amount they were willing to pay for modern water public utility.

Littlefair, (1998) in a study conducted in Akulam village revealed that a villager was willing to pay 75% of his annual income to dig a tube well but will not pay 10% for a piped supply whilst another was willing to pay 35% of his annual household income to provide a private well but is unwilling to pay anything towards the public water utility system. The conclusion made was that households with higher incomes are less willing to pay for public water utility supply while those with lower income are more willingness to pay for this service. It however could be a result of the general believe that it is governments resposibility to provide water and that it should be totally free. The judgement here is that price is the main determinant of water source in the household. Mirajul, et al, (2008) suggest an alternative explanation in terms of the availability of other sources and bad experience with the current water quality that has led to households upgrading their facilities to their desired level s. Kaliba, et al, (2005) provided a somewhat similar view stating that satisfaction with reference to current project performance is very important in influencing desire for improvement.

Other studies of households willingness to pay have focused on the role individual water attributes play in householdôs willingness to pay for water services. The attributes most often considered are; biological quality, interruption and security of supply, water pressure, bacteria count, time, distance, taste, and price (Snowball, et al. 2008; Hensher, et al. 2005; Kanyoka, et al. 2008). Kanyoka et al. (2008) reported that importance is placed more on the quantity of water and the pressure in the system than on the timings, hour of supply and water quality. Using choice modelling (CM) to investigate the influence of these attributes on willingness to pay, Snowball et al. (2008) found that whilst bacteria count was the most important attribute influencing willingness to pay, Supply interruption and price were also significant determinants of choice.

Findings by Snowball, et al. (2008) showed that, for a decrease in bacteria quality of one level, residents were willing to pay15.75% more for water and 0.12% increase in water price for any reduction of a household experiencing water discoloration. Hensher, et al, (2005) investigating household willingness to pay for water attributes reported that reliability of water and waste service was of value to customers such that households were willing to pay to reduce both the frequency and duration. Willingness to pay was found to be inversely proportional to the number of interruptions. This was attributed to the likelihood of adapting by looking for alternative sources to reduce the impact. Elsewhere, Mycoo, (1999) observed that Water problems affected householdôs willingness to pay for improvements in water services. Results presented showed that for every extra hour of reliable service a household was currently enjoying, the monthly amount that it was willing to pay for an improved service increased by a mean value of TT$6.65 per month.

In another study by Kanyota, et al, (2008) found that households without a private valued more water source, quality and frequency of supply than other attributes in their choice of water services. Research findings reported by Nam and Son, (2005) and colloborated by Mirajul, et al. (2008) indicated that households were more concerned about the quality of the good than the convenience of the service. Emphasising on the influence exerted by individual water attributes on household willingness to pay, Kanyota, et al.(2008) contends that willingness to pay is a function of not only its availability but also of alternative sources. It further stressed that improvement in the frequency of water supply was more important to households without private taps than those having privarte taps. Household already connected to piped water and with greater ability to pay for better services will be more concern with the source and quality of water than those without piped water with lesser ability to pay (Altaf,1997; Casey, et al, 2006; Littlefair, 1998). Nam & Son, (2005) connecting water connection fee and willingness to pay stated that households will be less willing to pay monthly bills if connection fee is high.

Findings of the study by Nam and Son, (2005) showed that median willingness to pay for piped water households for the improved water service was 148,000 VND, 35% higher than the average monthly water costs. For the non-piped water households, the median willingness to pay was double the average monthly water costs.A plausible explanation for this was provided by Farolfi, et al, (2007). It stated that householdss seemed to associate the availability of private tap water with the direct and indirect benefits they may receive from it.

McConnell & Ducci (1998) quoted in Farolfi, et al. (2007) mentions avoidance of medical costs, working hours gained in the case of diseases avoidance as a reslut of improved water quality as some of the factors that might contribute to households willingness to pay for water.The diference observed in the two groups of households was attributed to the extra connection cost to be incured by households not yet connected to piped water.

Katuwal and Bohare, (2007), made a very interesting revelation reporting on householdôs willingness to pay regarding timing and duration of water interruption. Households were found to have a strong preference to have water interrupted during weekdays rather than on the weekends and later on weekdays. It stated that people were willing to pay more if water is available for fewer hours a day indicating the exixtence of a relationship between water availability and willingness to pay. Fujita et al. (2005) reported that water supply volume restrictions due to limited water availability time resulted in the higher willingness to pay willingness to pay . The preference of interruption during weekdays was accounted for by the fact that water is needed most during the weekends for laundry and other household chores.

Researching on willingness to pay for multiple uses of water services in rural South, Kanyoka et al, (2008) linked water use and willingness to pay for water services. Households with private taps were reported to have a higher preference for productive use than those without private taps consuming less water. All water attributes under investigation were statistically significant with the exception of productive uses and produced a positive coefficient higher than the one observed for households with lower consumption. In concurrence, Fujita et al (2005) concluded that current water consumption; a function of current availability induces more interest in domestic water uses and that households without private taps consuming more water were less concerned with water prices. High consumption of a more expensive resource would have a negative influence on their family income was the justification advanced for this observation.

2.6.2 Gender, age of the household head and willingness to pay

Literature generally points to the fact that women are more willing to pay for water than men (Kayaga, et al. 2003; Farolfi, S. Et al. 2007; Vandemoortele, 2001). Reporting on a study conducted to elicit households` preferences and willingness to pay for multiple water uses in rural South Africa, Kanyoka, et al, (2008) revealed that gender of the respondent had an impact on the willingness to pay for water network refurbishment. Men were found to be less willing to pay than women. This is consistent with findings reported by Katuwal & Bohare

(2007) and concurred by Farolfi, (2007). In all two cases, gender of respondents was statistically significant and affected householdôs willingness to pay positively. In Zimbabwe, women were found willing to pay 40% more than men for an improved domestic water supply (Vandemoortele, 2001). Kayaga, et al, (2003) observed that in most households, women are charged with providing basic necessities that require water, such as preparation of food and general hygiene in the home. It is not surprising that women are keener on payment of water bills to avoid water services is not interruption.

Another study by Whittington, et al (1990) reported that, the sex of the respondent was statistically significant in the model for public stand posts, but not in the model for private connections. Women disproportionately bear the burden of collecting water. In concurrence, Vandemoortele, (2001) pointed that it is no surprise that women have a higher willingness to pay than men. Reduction of distance covered to fetch water from public stands posts was the reason was use to account for this. In contrast are findings by Harapap & Hartono, (2007) and Nam and & (2005). Consistent with this were findings reported by Gulyani, et al, (2005) that gender was a statistically insignificant influence on a householdôs preference for change versus no change in its current water supply situation. Nam & Son (2005) showed that the probability of a ñyesò increased with increases in the incidence of male respondents whilst Hensher, et al. (2005) pointed that male respondents showed significantly greater concern about the utility bill than female respondents. Household heads in most cases are males who are the main bread winners in the household and are responsible for payment of bills including water bills.

Age of household heads has been shown to influence households willingness to pay for water services (Vandemoortele, 2001; Fujita,et al.2005;Farolfi, et al, 2007).The most prevalent view in the literature is that older heads of households have higher willingness to pay than their younger counterparts. Farolfi, et al. (2007) observed that age was statistically significant and had a positive effect on the HHôs WTP. Hensher, et al. (2005) observed that younger respondents (namely, those under forty years of age) were less concerned about the frequency of outages than older respondents, but both age groups were about the same in their assessment of the length of interruptions. A plausible explanation lies in the fact that older people are usually the ones involved in either collecting water or paying for the services. Households targeted in this study were normally not headed by the young.

Vandemoortele, (2001) observed that Water fees and willingness to pay are often calculated on the basis of household`s ability to pay whereas the fees will be paid by women, with resulting gender inequities .Reporting on a water project in western Kenya, Vandemoortele, (2001) found that cost recovery was low despite seemingly high average household incomes. The cause was traced to the fact that although womenôs willingness to pay may be higher, their ability to do so is often very low. Women, who generally have much lower incomes than men, were responsible for this expense. It further emphasised the fact that affordability studies are often targeted at the wrong group, and frequently produce misleading results. The assessed levels of contribution are frequently much higher than is affordable for those (women) who will ultimately bear the cost.

Kaliba, et al, (2005) writing on the willingness to pay for domestic water improvement in the rural areas of Tanzania reported that age was negative and statistically significant. A view concurred by Luzar and Cosse (1998) stating that the relationship between an individualôs age and willingness to pay for improvement in water over a life cycle was non linear. Older people were more likely to choose to maintain the status quo due to the fact that they were less likely to be directly involved in water collection activities. This is consistent with findings presented by Adepoju and Amonona (2009) showing that age is positively related to willingness to pay for improved water sources. This indicates that as the age increases the tendencies to adopt and pay for improved water source will also increase.

In direct contrast to this is the view put forward by Fujita, et al. (2005) that the younger the age of the respondent, the higher the willingness to pay. Mbata, (2006) contends that the age of the household head is not a significant factor in explaining the willingness to pay for private connection. This consistent with findings of a study conducted in Manaus by Casey, et al, (2006). Results showed that households with zero willingness to pay were older. The plausible explanation was that age in itself is not an important sociological variable affecting willingness to pay for private water connection and that old and young heads of households value private water connection equally (Mbata 2006).

2.6.3 Tenure status of the household head and willingness to pay

The role of housing and tenure in determining householdsô willingness to pay is well documented (Kayaga, et al, 2003; Hensher, et al, 2005; Mycoo, 1999). In a study conducted to elicit the effects of household characteristics on willingness to pay, Kayaga, et al, (2003) concludes that families staying in houses owned by the household have a higher willingness

to pay for water bills than those staying in rented premises. In a similar study, Mycoo, (1999) found that homeowners and landowners were willing to pay a base value per month of TT$5.26 more than tenants and squatters. Justifying this view, Kayaga, et al, (2003) concludes that since households that stay in rented premises do not enter into legal obligation with water utility, they have a lower willingness to pay for water bills as they feel no obligation to the water utility.

Gulyani, et al, (2005) reporting on water markets, household demand, and service preferences in Kenya present an opposing view. no statistical significance was found between home ownership and household`s preference for change versus no change in its current water supply situation. Hensher, et al, (2005) in concurrence stated that there existed no significant difference between renters and home owners. This was attributed to the fact that only renters who paid their bills were included in the survey. This is in line with argument advanced by Kayaga, et al. (2003) stating that the results may have been affected by biases in data collection. Casey, et al, (2006) observed that households not willing to pay are likely to have received their homes from a government program.

2.6.4 Household structure and willingness to pay of the household head

A number of studies have suggested a positive relation between household size and its willingness to pay for water services (Kaliba, et al 2005;Nam & Son). In a Tanzanian study conducted in the Dodoma Region, family size was found to be positive and statistically significant. Elsewhere, testing for the same variable, Mbata, (2006) found it to be significant at 10% level of significance. A large family means frequent water collection trips and improvements relating to reducing congestion at watering points are likely to reduce time and effort expended in water collection (Kaliba, et al, 2005). Nam & Son, (2005) showed that the probability of a ñyesò increases with increases in household size and decreses with increases in the number of children in the household. Trade-off between the monthly water bill and other expenditures for children for households with a limited budget is the justification for the observed trend.(Nam & Son 2005).

Mbata (2005) showed that the variable household size was statistically significant but that it influenced willingness to pay for private water conection negatively. Kayaga, et al. (2003) did not find this variable to have any statistically significant effect on willingness to pay.This is consistent with results present by Gulyani, et al.(2005) and YusufAl-Ghuraiz & Adnan Enshassi (2005). The failure to account for renters and others who may be sharing the

utility bill with the home owner or household head accounted for the results obtained (Mbata, 2005). Kayaga, et al, (2003) on their part expalined this in terms of biases in data collection. some respondents falsified the household size due to the taboo associated with counting the number of children in a home in African cultures. the fear of the introduction of a flat tariff rate based on household size in case of metre failure accounted for the falsification of household size.

Hensher et al, (2005) in a study of water attributes and willingness to pay for water services identified number of children and other dependents in the household as one of the factors that strongly influence householdôs willingness to pay. The findings showed that households with children were more concerned about notification of upcoming interruption than households without children. This is in line with results reported by Farolfi, et al, (2007).Using the variable households practicing avoidance measure (PAB) as a proxy to number of children in the household, it was found to be positive and statistically significant at all three levels. Households with small children seem highly concerned with health risks posed by using contaminated water (Hensher, 2005). Evident was the dislike for having service interruptions on the weekdays by households with children than those without children. Accounting for this is the fact that households with children are more likely to be home during the weekdays.

2.6.5 Income of the household head and willingness to pay

An increase in household income increases the amount that households are willing to pay for private water connection (Adepoju and Amonona 2009; Fujita, et al. 2005; Kayaga, et al, 2003; Kayaga, et al, 2003). Mbata (2006) stated that, anything that increases householdsô income would increase the amount they are willing to pay for private water connection. Nam & Son, (2005) found that the probability of a ñyesò increased with increases in the composite income for both households with piped and without piped water). Using the coefficient of household expenditure, as a proxy for income and the proportion of income that a household is willing to pay for improved services, Adepoju & Amonona (2009) showed that all tested positive; an indication that an increase in income will increase the probability and the proportion of income that households would be willing to pay for improved water services. Mbata, (2006) opined these findings were in line with the economic theory of the demand for a good or service, which hypothesises that an increase in income increases the demand for that good, all other things being equal.

The higher a household's monthly income, the higher its willingness to pay for water services (Fujita, et al. 2005). Kayaga et al,(2003) showed that, estimated income levels moderate the satisfaction and loyalty relationship confirming the hypothesis that households with a higher estimated income have a higher willingness to pay than those households with a lower estimated income as a result of the accompanying higher affordability. Results obtained by Gulyani, et al. (2005) in a study of three Kenyan concurrence with the general trend observed in the literature. However, it showed that the household's willingness to pay is backed by an ability to pay considering that prices are perceived to be fair. Supporting this point were findings suggesting that a 10% increase in household income would result in about 1% increase in the probability of a household chosing to use an improved water source(Adepoju & Amonona 2009). Farolfi, et al. (2007) on the other hand showed that there was a clear correlation between willingness to pay and income. The correlation coefficient between willingness to pay for quantity and income was 0.23; lower than the correlation coefficient between willingness to pay for quality and income (0.51).

Kaliba, et al, (2002) found wealth and cash contributions to be negative and statistically significant. Elsewhere, payment for connection charges for improved water services was also shown to be negative (Adepoju & Amonona, 2009). This shows that as the connection charges increased, the willingness to pay for improved water services decreased. Adepoju & Amonona , (2009) observed that wealthier respondents were likely to choose to maintain their status quo because they were less likely to be directly involve in water collection and would easily access alternative sources. YusufAl-Ghuraiz & Adnan Enshassi, (2005) provided evidence that households accustomed to receiving free water will be reluctant to pay for water. In a study conducted in the Gaza Strip by YusufAl-Ghuraiz & Adnan Enshassi, (2005), the lowest mean of willingness to pay was in the middle governorate although it was not the lowest income of Gaza governorates. This is explained in terms of the high percentage of refugees in this area who used to consume free discharge water from UNRWA for a long period of time.

2.6.6 Employment status, occupation of the household head and willingness

Mbata, (2006) reported a positive relationship between willingness to pay and employment status of the head of HH. This underscores the importance of employment to WTP for private water connection. Research findings by Kayaga, et al. (2003) and concurred by Farolfi, et al, (2007) showed that heads of HHs who are engaged in formal employment, have a higher willingness to pay for water bills than heads of HHs engaged in informal employment.

People employed in formal employment get monthly wages or salaries at the end of the month, which period coincides with the billing cycle of the water utility. Those engaged in informal employment on their part get wages in discrete portions almost on a daily basis. Kayaga, et al, (2003) stated that at the end of the month when water bills are delivered, these households are most likely to have spent all the money on other necessities of life, and therefore may not be able pay the bills in time. A contradicting view is however presented by Luzar and Cosse (1998) showing that the explanatory farming as an occupation was found to be statistically significant. This observation can be explained in terms of availability of other free sources of water mostly traditional considered by the respondents as safe.

2.6.7 Level of education of the household head and willingness to pay

There seem to be a general consensus in literature on the positive influence educational level has on willingness to pay for improved water sources (Adepoju & Amonona, 2009; Kayaga, et al, 2003; Luzar & Cosse, 1998). This indicates that as the level of education increases the tendencies to adopt and pay for improved water source will also increase. Adepeju and Amonona (2009) observed that the more educated the respondents, the more likely they would be willing to adopt improved water services from private enterprise having the knowledge of the consequences of shortage in water supply or its unreliability. Luzar & Cosse, (1998) using two variables for education; level of lower education (EDU1) and level of higher education (EDU2) corroborated these findings. Both variables were found to be statistically significant with a negative sign at EDU1 and a positive sign at EDU2 as hypothesised. In concurrence, Mbata, (2006) showed level of education to be statistically significant.

Investigating the role of level of education of the household head on the satisfaction and loyalty relationship, Kayaga, et al. (2003) points out that, education improves the awareness of decision-makers in the home, such that they attach more value to a better quality water source. They further emphasise that educated respondents attach a higher opportunity cost for time spent collecting water from other sources, hence freeing more time to engage in more valuable tasks. Comparing those with high levels of education with the poorly educated, Kayaga, et al, (2003) stated that those with higher education are more likely to appreciate the unique nature of potable water in terms of economic, social and environmental externalities. Gulyani, et al, (2005) reporting on a study of three Kenyan cities revealed that level of education was not a statistically significant influence on a householdôs preference for change versus no change in its current water supply situation. It further emphasised that economic

factors such as price and quantity, rather than socioeconomic variables determine households willingness to pay for improve services. The transformation of user perception due to a combination of failing public supply and the emergence of poorly functional and unregulated markets was also put forward to account for this deviation.

2.6.8 Willingness to pay in the rural and urban context

The Location of the Household is an important variable explaining householdôs willingness to pay for improved water quality (Farolfi, et al, 2007). Mirajul, e t al, (2008).observed that location (rural and urban) significantly affect people`s willingness to pay. Reporting on a Study on coping with unreliable water and willingness to pay for improved supply in Kathmandu, Nepal, Jatuwal and Bohare (2007) stated that the demand for water in the urban area was comparatively higher than that of the rural area. This is in consistence with research finding presented by Harapap & Hartono (2007) and Haq, et al, (2008). Commenting on the general trend in literature, Litllefair, (1998) contends that, community response to purchasing water hitherto has been viewed in terms of total financial values resulting in unmet demands and dissatisfaction with water supply projects. The suggestion made was that, although such prices are important for public water utilities to identify, it is equally important to recognise specific spatial and temporal influences which determine the individualôs response to the purchase of water.

Haq et al, (2008) reporting on households willingness to pay for safe drinking water supply in Abbottabad district found that it was higher amongst the urban areas (92%) than rural areas (69 %) . Observation by Olajuyigbe and Fasakin, (2010) is concurrent with these findings. They found that the gradient of willingness to pay decreased away from the city core. This is can be considered an ambiguous observation as access to public water is known to decrease away from the city core to the periphery. Justifying the lower level of willingness to pay in rural areas, Haq, et al, (2008) stated low income level, presence of own sources of drinking water, and low level of education. Olajuyigbe and Fasakin, (2010) associated the abnormality observed in a medium size Nigerian city to constrain to the seemingly better access by the city core due to institutional deficiencies. As a result households regarded the development of public water system as a ñGreek giftò.

Farolfi et al. (2007) presented some interesting results showing that rural households were willing to pay a higher amount for an improved water quantity despite their much lower income. Only 6% were willingness to pay for an increased quantity of water in the urban area

as compared to 58% in the rural areas. Worth noting is the fact that these households that were willing to pay in the urban area were exclusively among the few receiving their water from a collective tap. On the other hand, households in both areas were willingness to pay for a better quality of water. The figure nevertheless was again much higher in the rural areas (67%) than in the urban areas (20%). Consistent with this were results an investigating of willingness to pay for water services in the Gaza Strip by YusufAl-Ghuraiz, & Adnan Enshassi, (2005). Using the ascending bid (AB) to estimate willingness to pay, it was found that an average household would pay about 3.06 NIS/ m3 with average being somewhat higher in rural areas than in urban. The average in cities was 3.1 NIS/m3 and 3.4 NIS/m3 in villages. The absence of water supply service in many parts of these rural areas and the fact that some villages had no water network was used accounted for the highest average of willingness to pay in rural areas.

2.7 Conceptual framework

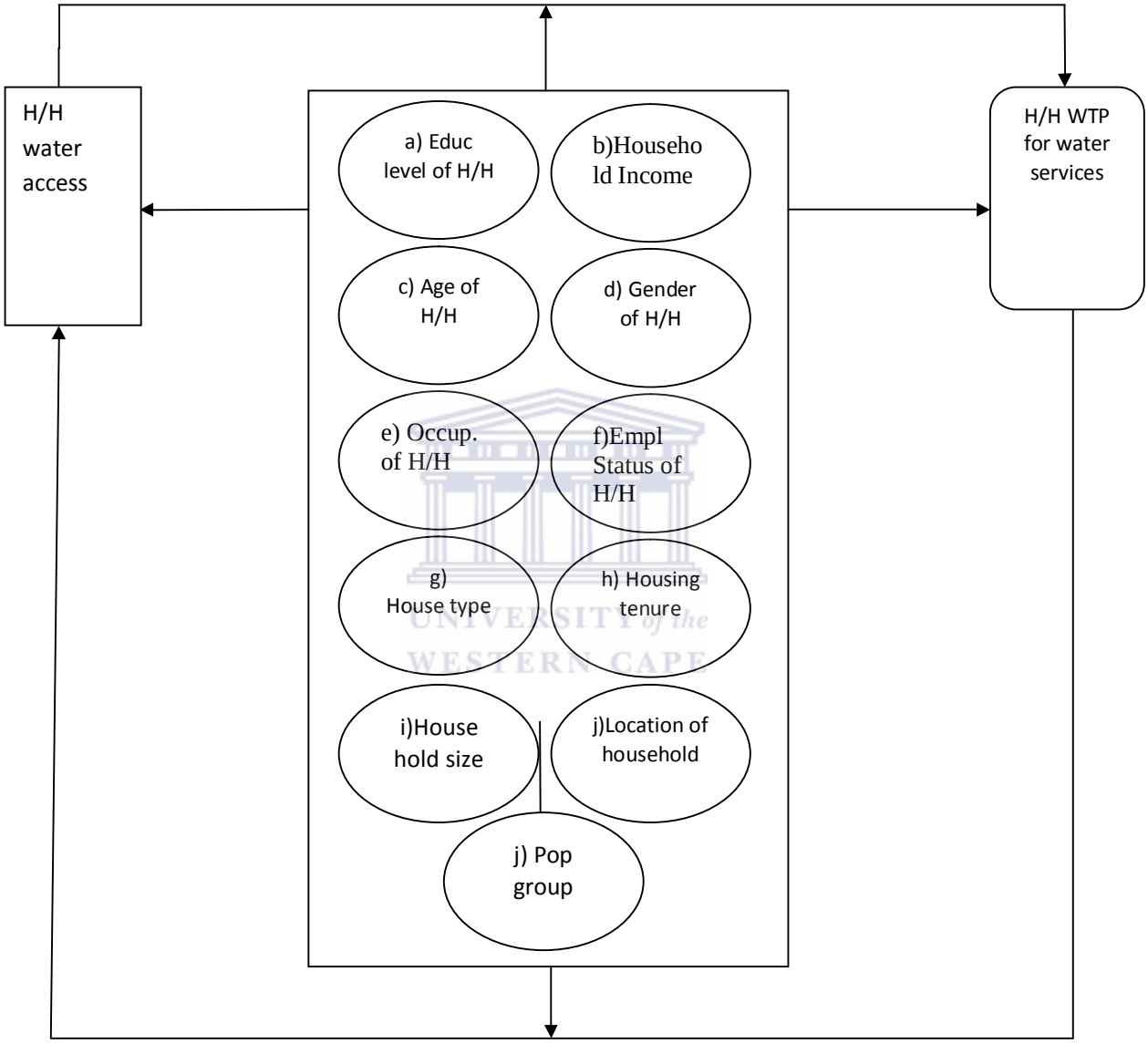
The focus here will be on the formulation of a conceptual framework based on the literature reviewed. The relationship between access to safe drinking water and willingness to pay can be conceptualised as a two stage relationship where a set of causal factors impact on a series of intermediate indicators (household variables), which in turn determine the final outcome in terms of households access to safe water. Kayaga, et al, (2003) studying customer satisfaction and customer loyalty towards the urban water utility in Uganda indentified a number of household characteristics exerting what he called moderator effect on this relationship. He put forward a model which will be adapted to fit the present study. This conceptual approach will try to explain the relationships that exist between householdôs access and willingness to pay for safe drinking water. The framework incorporates significant components proposed by Kayaga, et al. (2003).The difference however lies in the fact that, while Kayaga, et al. (2003) focused on customer satisfaction and loyalty, this study focused on access and willingness to pay for water services. It also incorporates many variables that were not considered in the previous model.

The variables used in the present framework fall under four major groups which are

- Demographic variables (age, gender, and population group)
- Socioeconomic variables (level of education, employment status, occupation, income)
- Household variables (House type, tenure, household size)

Location variables (Province of residence)

Figure 2 A framework for assessing household Water access and willingness to pay



Source: Adapted from Kayaga, et al. (2003)

2.3.1 Water source, quality and use

Literature informs that households having poor or limited access to safe water are willingness to pay for either better access or improvement in the quality of water. This is a show of appreciation of the advantages attached to safe water which could be in terms of

time gained in term of reduction in water collection time, or improvement in health status. It could also be explained in terms of money saved that hitherto could have been used to access water at higher cost or in hospital bills in the case of water related illness. However, alternative sources are sometimes preferred for varied reasons ranging from affordability to proximity to the dwelling unit. On the other hand, households capable of paying for water services would not be willing to pay if they perceive water to be either expensive or if households consider alternative water supply safer and easily accessible. It is predicted therefore that households with an alternative source of water will have a lower willingness to pay for services regardless of the level of access.

2.3.2 Gender of the household head

Women in low-income countries, with the help of their children, are traditionally the primary collectors, users and managers of water in the household. Since the sole responsibility for water collection in the household befalls women, they are the hardest hit, in terms of extra energy and opportunity cost of providing water from alternative sources when water supply is interrupted. Female household heads will therefore have a more favourable attitude towards the utility, to ensure service continuity. Female household heads generally are known to have low income and limited earning possibilities than male household heads. This coupled with the fact that female headed households most often are comparatively larger impacts negatively on their ability to access safe water. It is therefore expected that Female headed households will have lower access to safe water sources than male headed households. On the other hand, female Headed households will exhibit higher levels of willingness to pay than male headed households.

2.3.3 Age of the household head

Older household heads especially in the rural areas will be less willing to switch to new and modern water sources due to the fact that they are use to the traditional free sources more so if when the switch entails some cost to them in terms of connection or user fees. However, because water is heavy to carry, and where the sources are far away from the residence, older people who may not be able to transport water a reasonable distance would seek private water connection. Older heads of household most often are not gainfully employed and would be depending on either pension and social grants or allowances from their children. This impacts negatively on their ability to pay for safe water consequently limiting their access to safe water sources. The young on the other hand are gainfully employed and therefore are more capable to pay for safe and improved water sources than the old. The expectation therefore is

that households headed by the young will have better access to safe water than households headed by the old. These households will exhibit higher levels of WTP than those headed by the old.

2.3.4 Housing and tenure status

Ownership status of the residential house and family occupancy density are also predicted to moderate WTP and therefore access to safe water. The policy of most water utilities is to deliver bills to the landlords as the responsibility of water connection befalls them and not the tenants. It is anticipated that customers who live in owner-occupied premises will have better access to safe water and display better willingness to pay for services, than those living in rented properties. This will be even lower if several families share one property, as a result of low agreement on shared bills.

2.3.5 Household size

Water needs of large households are expected to be more than those of small sized households. Larger size means greater demand on the household resources which may negatively impact on its ability to access safe water. Absence of water in a home would cause relatively more inconvenience for a larger household than for a household of small size. It would be easier for a smaller household to receive water from a neighbour at a smaller or no cost than for a larger household. The prediction therefore is that the larger the size of the household, the lower are the chances of better access to safe water and the more favourable it will be towards payment of water bills.

2.3.6 Household income

A householdôs water connection is determined by its ability to pay. The higher a household income, the better is its access to safe water sources. Households with a higher disposable income are more likely to have water connected into their homes and to respond faster to water bills than households with lower income levels. This is because households in the former category have a higher ability to pay for utility services, than those in the latter category. They however will not be willingness to pay for improved or better access due to the fact that they already have better access to safe water. The expectation is that, higher income households will have better access to safe water but will display low levels of willingness to pay while lower income households will have poor access to safe water and higher willingness to pay.

2.3.7 Employment status of the household head

The household headôs ability to earn income (labour force participation) makes him eligible to connect water into the house due to the fact that this entails cost. Households headed by the employed will naturally have better access to safe water sources than those headed by the unemployed. The number of employed household members would also influence its access to safe water and willingness to pay for it as household income is expected to increase with increase in the number of employed members. Households headed by the employed would have better access to safe water and display higher levels of willingness to pay than those headed by the unemployed. This is also expected to increase as the households labour force increases.

2.3.8 Occupation of the household head

People engaged in informal employment, most often receive wages irregularly compared to those in formal employment. In fact, most of such workers receive their wages on a daily basis, with no job security for the rest of the month. For such people, it would be not only difficult to save up money to afford water connection fee but also to cope with utility bills delivered on a monthly basis. It is therefore expected that household heads that are in formal employment would have better access to water and display higher willingness to pay, than their counterparts who are in informal employment.

2.3.9 Education level of the household head

More educated heads of households are expected not only to be aware of the health implications of alternative sources of water but also to better appreciate the importance of cost recovery for sustainability of service delivery. This is explained by the fact that they have a higher opportunity cost for time spent collecting water from off-plot alternative sources, and prefer engaging in other more productive tasks. Also, the highly educated are also aware of the health risk associated with using unsafe water and are therefore willing to go an extra mile to access safe water. It is expected therefore that householdôs heads with some formal education will have greater access to safe water and also show greater willingness to pay for improved water sources than those headed by the uneducated.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter explores and discusses the various research methods used in this study beginning with the nature and design of the study. This is followed by an examination of the instruments and tools used in this study. Particular importance is given to the variables used providing a thorough and comprehensive description of all the variables used in the analysis. Statistical methods used to measure the influence of the demographic and socio economic factors considered in this study on householdôs access to safe drinking water and WTP are discussed. It ends with a discussion of the limitations of the study.

3.2 Research setting

The study used census data obtained from the South Africa General Household Survey (GHS) conducted in 2007. In this survey, 784 enumerators and 260 supervisors and coordinators and 46 quality assurers where employed. Information was uniformly collected on persons and private households throughout the country. 34902 households in total were sampled and visited and 29311 household heads were successfully interviewed.

3.3 Study design

This study used a cross-sectional survey design to assess householdsô access to water and willingness to pay for safe water in South Africa. The choice of the design was largely due to the fact that it allows for the collection of data at a single point in time, coupled with the fact that it is a relatively fast method and best fitted for studies with a large number of participants. This design is in line with that used in most quantitative studies done in the fields of statistics and mathematics.

3.4 Sample

This study used a multi stage stratified probability sample with Stratification of sample done per nine provinces of South Africa and according to 53 district council within provinces. The design included two stages of sampling. Firstly, primary sampling units (PSUs) were systematically selected using Probability Proportional to Size (PPS) sampling techniques. During the second stage of sampling, Dwelling Units (DUs) were systematically selected as Secondary Sampling Units (SSUs). A PPS sample of PSUs was drawn in each stratum, with the measure of size being the number of households in the PSU. Altogether approximately 3 000 PSUs were selected. In each selected PSU a systematic sample of ten dwelling units was

drawn, thus, resulting in approximately 30 000 dwelling units.Population coverage in this study were private households and residents in workers hostels in all the nine provinces of South Africa and does not cover other collective living quarters.

3.5 Methods

3.5.1 Data source and collection

The data used in this study was sourced from the South African General Household Survey (SAGHS) 2007 which has been conducted annually by Statistics South Africa since 2002. The data was obtained from Statistics South Africa (Stats SA) in a SPSS statistical software format.

The 2007 GHS utilised a household questionnaire to collect data used in this study. The questionnaire was used to collect information from all the people living in the sampled households. It had a total of 166 questions group into different sections of the questionnaire on the following topics:

a) Cover page, household information, response details, field staff information, result codes, etc.

b) Flap Demographic information (name, sex, age, population group, etc.)

c) Section 1 Biographical information (education, health, disability, welfare)

d) Section 2 Activities related to work and unemployment

e) Section 3 Non-remunerated trips undertaken in the 12 months prior to the survey

f) Section 4 Household information (type of dwelling, ownership of dwelling and other assets, electricity, water and sanitation, environmental issues, services, transport, expenditure etc.

The variables of interest of the study were found mainly in the questions were classified into four main classes; socio-demographic, socio-economic, location and water services related variables.

3.5.2 Description of study variables

Variables used in this study were selected from variables used in SAGHS 2007 and divided into the already mentioned four groups. That is, demographic, socio- economic, location and water services related variables. A description of these variables is considered given here.

- Demographic variables: age, gender and population group.

- Socio-economic variables**:** .occupation, employment status, income, economic activities**.**
- Location variables: province of residence.
- Water related variables: household main water source, distance to water source, and perception of water, rating of water services.
- Household variables: dwelling type, dwelling ownership, living quarters.

3.6.1 Demographic variables

3.5.1.1 Age groups

To determine the age of household members, they were asked the question ñhow old is (the person) in completed years. The enumerators were instructed to write the completed years as integers and not in words. These were re-coded into groups and capture using SPSS as follows: (1)00-04,(2)05-09,(3)10-14,(4) 15-19, (5) 20-24, (6) 25-29, (7) 30-34, (8) 35-39, (9) 40-44, (10) 45-49,(11) 50-54, (12) 55-59, (13) 60-64 and (14) 65-69,(15)70-74,(16) 75-79,(17)80+, (99) Unspecified.

3.6.1.2 Gender

The question used to determine gender was ñis (the person) male or femaleò. The enumerators were instructed not to assume gender of members of the household by looking at people`s names or physical appearances. The gender of head of household is a derived variable and was obtained by allocating the gender of the person who indicated head/acting head of household. The gender variable was re-coded as follows: (1) Male (2) Female and (9) Unspecified.

3.6.1.3 Marital status

The marital status of each household member was determined by asking the question: ñwhat is the (personôs) present marital status?ò Both modern and traditional marriages were considered. The final coded list for marital status the following categories: (1) Married, (2) Living together as unmarried partners, (3) Widow/Widower, (5) never married, (9) Unspecified**.**To determine whether the spouse/partner lived in the same household the question ñDoes the personôs spouse /partner live in this householdò was asked particularly to married household members or those living together as husband and wife. They were expected to either respond by Yes or No. Answers to this question were coded and captured as follows: (1) Yes, (2) No, (8) Not applicable, (9) Unspecified.

Those who answered Yes to the previous question (married or living together as husband and wife), another question: ñwhich person is the spouse?ò was asked to verify the information on the previous question, which seeks to determine whether couples within the visited household lived together or not.

3.6.1.4 Population groups

The question ñWhat population groups (the person) belong to?ò was asked to determine the population group of the persons in the sampled households. The respondent was expected to answer for each member without any assumptions. In this instance, the enumerator was also instructed not to make any conclusions which may be influenced by his observation or using peopleôs names during the interview. This is a very sensitive question but its relevance is justified by the fact that the composition of South African population needs to be known. The population group of head of household is a derived variable and was obtained by allocating the population group of the person who indicated head/acting head of household. This answer to this question was coded and captured as follows into: (1) African/black, (2) coloured, (3) Indian/Asian, (4) White, (9) other and unspecified.

3.6.1.5 Education

To determine the highest level of education, the question ñwhat is the highest level of education that (the person) has successfully completed?ò was asked to all household members. Only qualifications already obtained were to be entered and not the current level of studies that a person was still busy with. Diplomas and certificates were to be of at least six months duration. Answers to this question was recorded as follows: (00) No schooling, (01) Grade R/0, (02) Sub A/Grade 1, (03) Sub B/Grade 2, (04) Grade 3/Standard 1, (05) Grade 4/Standard 2, (06) Grade 5/Standard 3, (07) Grade 6/Standard 4, (08) Grade 7/Standard 5, (09) Grade 8/Standard 6/Form 1, (10) Grade 9/Standard 7/Form 2, (11) Grade 10/Standard 8/Form 3, (12) Grade 11/Standard 9/Form 4, (13) Grade 12/Standard 10/Form 5/Matric, (14) NTC I, (15) NTC II , (16) NTC III, (17) Certificate with less than grade 12/STD 10 , (18) Diploma with less than grade 12/STD 10, (19) Certificate with grade 12/STD 10, (20) Diploma with grade 12/STD 10, (21) Bachelor's Degree, (22) Bachelor's Degree and Diploma, (23) Honours Degree, (24) Higher Degree (Masters, Doctorate), (25) Other, (26)Don't know, (99) Unspecified.

3.6.1.6 Household composition

The relationship of household members to the head of household was determined by asking the question ñwhat is the personôs relationship to the head of household?ò Enumerators were

instructed to cross check the information with the one in the flap, especially with regard to the head or acting head of the household. This question was applicable to everyone every person who stayed in the households in selected dwellings units four nights per week in the four weeks prior the interview. This was recorded as follows: (01) Mark the head/acting head, (02) Husband/wife/partner, (03) Son/Daughter/Stepchild/Adopted child, (04) Brother/Sister/Stepbrother/Stepsister, (05) Father/Mother/Stepfather/Stepmother, (06) Grandparent/Great-grandparent, (07) Grandchild/Great-grandchild, (08) Other relative (e.g. in-laws or aunt/uncle), (09) Non-related persons, (99) Unspecified.

3.6.2 Socio economic variables

3.6.2.1 Employment status

This applied to those members of the household who fell within the working age group. That is, 15 to 65 years old. By definition, a person considered unemployed was one within the economically active population (15-65 years) who was available to work and actively looking for a job but was unable to find one within a week prior to the interview. The question used for this was: ñin the past seven days, did the person do any work for a wage or salary, commission or any payment in kind?ò This included all types of paid employment except domestic work. Enumerators were instructed to probe for casual work, piece jobs and part-time work. This was recorded as follows: (1) Yes and (2) No.

3.6.2.2 Income

The question on income was asked to those household members who were involved in an economic activity of some sort in the last seven days prior to the interview. Due to the nature of the information (considered personal) enumerators were instructed to inform respondents of its confidentiality and the question asked was: ñwhat is the person`s total salary or pay in his or her main jobò? They would then draw a range of money in Rand and respondents would point on one of these incomes, and state whether it is weekly, monthly or annually. Answers to this question were all converted to monthly income and recorded as follows: (1) None,(2) 1-200, (3) 201-500, (4)501-1000, (5)1001-1500, (6)1501-2500, (7)2501-3500, (8) 3501-4500, (9)4501-6000, (10)6001-8000, (11)8001-11000, (12) 11001-16000, (13)16001-30000, (14)30001+.

3.6.2.3 Occupation

To determine the occupation, all the household members aged 15 years or older were asked to state the kind of work the person did at his /her job during the last seven days prior to the

interview. To better understand and establish occupation, another question was asked to know the personôs main task at his/her job. The information obtained was categorized and recorded as follows: .(1) legislators, senior officials and mangers, (2)professionals, (3)technical and associate professionals, (4) clerical,(5) service workers and shop and market sales workers,(6) skilled agricultural and fishery workers,(7) craft and related trades workers,(8) plant and machine operators and assemblers,(9).

3.6.2.4 Economic sector

This variable was derived from a number of questions asked in relation to the respondents main economic activities and indicates the economic sector in which the person works. The variable was grouped into categories and recorded as follows: (1) Agriculture, hunting, forestry and fishing, (2) Mining and quarrying, (3) Manufacturing, (4) Electricity, gas, steam and water supply, (5) Construction, (6) Wholesale and Retail trade, (7) Transport, storage and communication, (8) Financial, insurance, real estate and business services, (9) Community, social and personal services, (10) Private households with employed persons, (11) Exterritorial organization, and (12) Representatives of foreign governments.

3.6.2.5 Main source of income

The question asked to know the main source of household income was: ñWhat is the main source of income for this householdôô? This question was applicable to all household members. Enumerators were instructed to ask for the main source of income even in cases where more than one is applicable and information recorded thus: (1)Salaries and Wages (2), Remittances(3) Pensions and Grants,(4) Sales of farm products and services,(5)Other non income, (6) No income.

3.6.3 Location variables

3.6.3.1 Province of usual residence

This location variable (residential area) was derived from the province where the household was found. That is, the nine South African provinces and recorded as follow: (1) WC: Western Cape; (2) EC:Eastern Cape; (3) NC: Northern Cape, (4) FS: Free State; (5) KN: KwaZulu-Natal; (6) NW:North West; (7) GP: Gauteng; (8) MP: Mpumalanga; and (9) L: Limpopo. This will allow for the determination of disparities between the provinces in an effort to evaluate how well the government is doing in bridging the gap the previously neglected Black dominated and the white favoured provinces and how well South Africa is doing in terms of the millennium development goals (MDG 7, target 10)

3.6.3.2 Type of living quarters

The question on type of living quarters was ñWhat is the type of living quartersò? This question was asked to obtain information on type of households living quarters. Thus it was recorded as follows (1) Private dwelling, and (2) Workers Hostel.

3.6.4 Household variables

3.6.4.1 House types

To determine the house type occupied by a household the respondents were asked to indicate the type of main dwelling and other dwelling that the household occupied. The interest was in the main house and but other dwelling(s) were also considered if there existed more than one structure that belongs to the household. The response was recorded in categories as follows: 01 = Dwelling/House or brick structure on a separate stand or yard or on farm, (02) Traditional dwelling/Hut/Structure made of traditional materials, (03) Flat or apartment in a block of flats, (04) Town/Cluster/Semi-detached house (Simplex, Duplex or Triplex),(05) Unit in retirement village, (06) Dwelling/House/Flat/room in backyard, (07) Informal dwelling/Shack in backyard, (08) Informal dwelling/Shack not in backyard, e.g. in an informal/squatter settlement or on farm, (09) Room/Flatlet, (10)Caravan/Tent, (11) Other.

3.6.4.2 Tenure status

To determine tenure status a question was asked on the ownership of the households dwelling unit to establish if households owned, rented or occupied rent-free dwellings. The response was recorded in categories as follows: (1) Owned and fully paid off, (2) Owned, but not yet fully paid off (e.g. with a mortgage), (3) Rented, (4) Occupied rent-free as part of employment contract of family member, (5) Occupied rent-free not as part of employment contract of family member, (6) Occupied as boarder, (9) Unspecified.

Enumerators were also instructed to determine if there was any housing subsidy received in order to obtain the dwelling occupied by a household. The question asked was: ñDid any member of this household receive a government housing subsidy, such as RDP housing subsidy, to obtain this dwelling or any other dwelling?ò The answers were recorded as follows: (1) Yes (2) No (3) Donôt know.

3.6.4.3 Main source of water

The question asked to determine a householdôs source of water was: ñWhat is the householdôs main source of water?ò Instruction given to enumerators was that if people were getting water from two sources they should name the source that they use for drinking and cooking. It was

thus recorded as follows: (01) Piped (Tap) water in dwelling, (02) Piped (Tap) water on site or in yard, (03) Borehole on sit, (04) Rain-water tank on site,(05) Neighbourôs tap, (06) Public tap, (07) Water-carrier/Tanker, (08) Borehole off site/communal, (09) Flowing water/Stream/River, (10) Dam/Pool/Stagnant water (11) Well, (12) spring, (13) other.

3.6.4.4 Distance of water source from dwelling unit

ñHow far is the water source from the dwelling, yard or site?ò was the question asked to determine the distance from households dwelling unit to water source. This question was applicable only to households where the main source of water was not in the dwelling, yard or on site. Enumerators were instructed to consider the distance covered using the usual means of transport to this source. This was recorded thus: (1) Less than 200m, (2) Between 201m ï 500m, (3) Between 501m ï 1km, (4) More than 1km, (5) Donôt know, (8) Not applicable.

3.6.4.5 Quality of water

Householdôs perception of water quality was determined by asking people either answer Yes or No to a category presented to them. The categories were as follows: (1) Safe to drink, (2) Clear, (3) Good in taste, (4) Free from bad smells.

3.6.4.6 Access to piped water

The question, ñDoes this household have access to piped water from a local municipality?ò was asked to determine if the water used in the household was from a tap either in the dwelling, yard or communal. The answer was recorded thus: (1) Yes, (2) No.

3.6.4.7 Perception of water services

To evaluate the municipal water services that the households receive people were asked to rate the services according to categories provided to them and the answers recorded as follows: (1) Good, (2) Average, (3) Poor, (8) Not applicable.

3.6.4.8 Payment of water

The question used to determine whether a household pays for water was: ñDoes the household pay for water?ò The response was recorded thus: (1) Yes, (2) No, (8) Not applicable. The household has to actually pay for the water for the answer to be 'Yes'.

3.6.4.9 Reason for the non-payment of water

In case where the household did not pay for water, a follow up question was asked to probe into reasons for non-payment. The respondents were given a range of options to choose from by either answering Yes or No. These categories were as follows: (1) Metering system is irregular, (2) No metering system is in place, (3) Billing system is irregular, (4) No billing system is in place, (5) Meter is broken, (6) Canôt afford to pay for water, (7) Unhappy with the level of service provided, (8) The government should supply all water free, (9) Others do not pay for water, (10)The household only uses the free basic amount, (11) Other.

3.6.4.10 Frequency of water interruption

ñHow often does the household have water interruptions in its piped water supply?ò was the question used to determine the frequency of water interruptions and reliability of the services rendered by the water supplier. It was only asked to households using piped water, regardless of whether it was in the dwelling or communal. The variable was recorded as follows :(1) Daily, (2) Weekly, (3) Monthly, (4) 6-monthly, (5) Yearly, (6) Almost never, (8) Not applicable.

3.6.4.11 Cause of interruption

To determine the cause of interruptions respondents were asked the question; "What normally causes the interruption?ò and the variable was categorised and recorded thus:(01) Burst pipes, (02) Pump not working , (03) General maintenance , (04) Not enough water in the system (Demand too high). (05) Water only delivered a fixed times, (06) Non-payment for services (Cut off), (07) Vandalism, (09) donôt know, (88) Not applicable.

3.6.4.12 Rectification of piped water interruption

To find out how long it takes for the water interruptions mentioned above to be rectified, the respondents were presented a list of options to indicate how long it took when it last happened.The variables obtained were recorded as follows: (1) The same day, (2) Within two days, (3) Within a week, (4) Longer than a week, (5) Longer than a month, (6) Donôt know, (8) Not applicable.

3.7.1 Data analysis

This section deals with the analysis of data obtained from household questionnaires used in the 2007 South Africa General Household Survey (GHS). Methods used include both descriptive and inferential statistical methods. Focusing on frequency distribution and cross tabulation (Independent variables are cross tabulated with dependent variables according to

the level of measurement) ; Chi-square, Phi and Cramerôs V, Lambda are utilized to test the statistical significance of the relationship between variables.

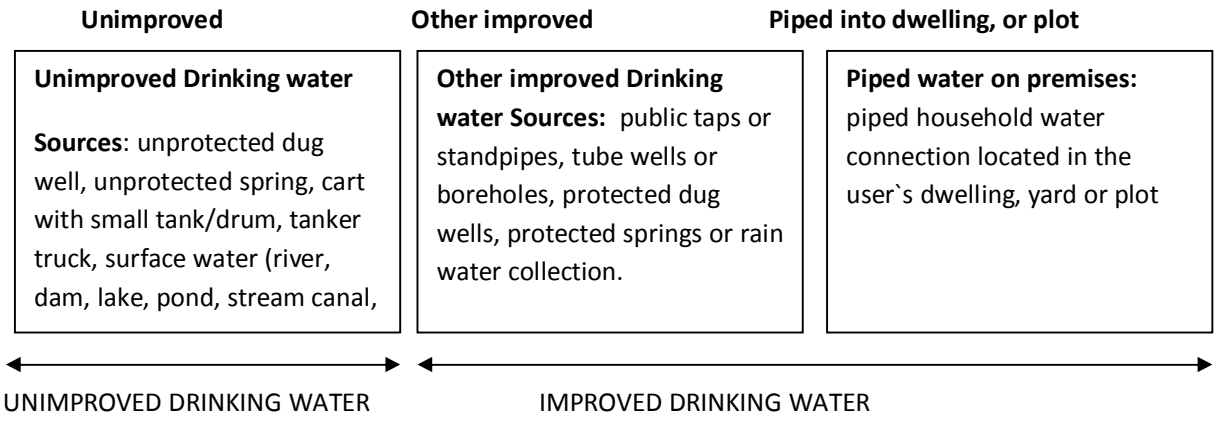
The analysis was based on the following research questions:

- How do households access drinking water in South Africa?

The first task here is to determine the different sources of water using the variable ósource of waterô. The various sources stated are grouped according to the three major categories used by the WHO/UNICEF Joint Monitoring Programme (JMP) for water supply and sanitation which is the official United Nations Mechanism tasked with monitoring the progress towards the MDG relating to drinking water. The JMP in looking for better ways to monitor access to drinking water developed a new way of presenting the access figures by aggregating and refining in a ladder format (ladder concept) that allows for reporting on the more nuanced picture of access that goes beyond the improved and unimproved dichotomy without changing the MDG definitions.

The ladder currently allows disaggregated analysis of trends in a three rung ladder for drinking water. The water ladder has been prepared showing the global proportions of those using unimproved water sources, those using improved water sources other than piped household connections, and those benefiting from household connections in a dwelling, plot or yard as presented in Figure 3.

Figure 3: United Nations ladder concept for the analysis of water access



The question is then examined by doing a frequency distribution of the variable water source.

This analysis enabled the researcher to ascertain the proportion of the population accessing the different sources of water and how it varies across the nine provinces and between the rural and urban areas. These variables were then cross tabulated with the age, gender, population group, income, employment status, occupation, tenure status and location to determine the influence these variables exert on household water access. These variables were in each case a used as the predictor variables while water source was used as the outcome variable. The analysis tested the significance of association through Chi-square. Since a nominal does not have order and direction, Cramerôs V statistic is excellent at measuring the strength. Kendall`s tau-b is used for ordinal variables.

- *What are the levels of wiliness to pay and how does it vary across the nine provinces and between the rural and urban areas?*

This question was analysed by means of univariate descriptive analysis using frequency distribution with the variable ódo you pay for waterô. By so doing the rates of willingness to pay and non willingness to pay were calculated and the variation across the provinces determined. This nominal outcome variable was then be cross-tabulated with the predictor variable Water source, age, gender, population group, income, employment status, occupation, tenure status and location .The relationships are quantify by means of chi-square to test the association and measurement of strength through Cramerôs V statistics for nominal variables and Kendall`s tau-b is for ordinal variables.

- *What are the reasons for non payment of water?*

This question was analysed by means of frequency distribution using the nominal variable the ómain reason for non paymentô utilized. This analysis allows for the determination of the reasons for non WTP and their variation across the country.

- *What are the main causes of water interruption?*

The variable óreason for interruptionô is analyze to provide answers to this question. The different causes advanced for water interruption are regrouped under major categories and a frequency distribution applied to it to determine the interruption rate per cause and how this varies across the provinces.

- *How long does it take for piped water interruption to be rectified?*

To answer this question the variable órectification of water interruptionô is used and a frequency distribution of the various categories of responses provided is done to determine how long it takes for water interruption to be attended to by the water utilities. To determine how rectification time influences peoples willingness to pay, a cross tabulation is done with órectification of water interruptionô considered the predictor variable and willingness to pay the outcome variable.

- *How do households perceive water quality and service?*

The variables ówater qualityô and ówater service is used to answer this question by doing a frequency distribution of these variables across the provinces and in the rural and urban area. To determine the influence water quality and service perception has on householdôs willingness to pay, cross tabulations are done. The perception of water service and quality are the predictor variable while willingness to pay is the Outcome variable. Cramerôs V is used to test for the statistical significance of the relationship.

- *What is the mean distance of water source from dwelling?*

This question was analysed by means of univariate descriptive analysis using frequency distribution with the variable distance of water source from dwellingô to show how it varies with age and sex of the household head and across the provinces . The variable was then cross tabulated with some household variables considered as predictor variables to determine the relationship between these variables and household proximity to water source.

3.7.2 Hypotheses testing

The hypotheses formulated for this study was tested using the Chi-Square test of associations. Chi-square is only a test of significance, not a measure or strength of a relationship between variables.

$$X^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Where: **O** = Observed frequencies, and **E** = Expected frequencies

The various hypotheses tested are;

- Access to water is related to income and level of education.
- Willingness to pay is related to income and level of education.

- Male headed households are less willing to pay for water than female headed households.
- Access to water and willingness to pay is higher in urban areas than in rural and areas.
- Access to water is related to household size.
- Willingness to pay for water related to household size.
- The employed have higher levels of access to water and are more willing to pay than the unemployed.

3.7.3 Multivariate analysis

The second part of the analysis used multiple regression analysis for predictive purposes to ascertain the causal effect of independent variables under study on the dependent variables; water access and willingness to pay. Logistic regression is utilised because the outcome variables are categorical. Due to the dichotomous nature of the outcome variable two binary logistic regression models are built for this purpose. Provide one or two refs to support their usage.

CHAPTER FOUR: FINDINGS

4.1 Introduction

This chapter attempts an assessment of household water access and measures household willingness to pay for water in South Africa. The key indicators; access and willingness to pay are analysed in context of the various determinants. Focus is on demographic and socio economic variables to establish levels of household water access and willingness to pay answer the research questions set for the study. The hypotheses are also tested for possible associations between the variables under study and household water access on the one hand and willingness to pay on the other by means of Chi-square, lambda, Phi and Cramer`s V statistics. It begins with the profiling of the different sources of water by age, gender, population group and province of residence of the household head. An examination of distance to water source, perception of water quality and service, reasons for non willingness to pay and rectification time is also done.

4.2 Access to water by households main source of drinking water

Main source of drinking water is analysed to determine household access to water using the WHO/UNICEF Joint Monitoring Programme (JMP) methodology which groups water sources into the following three categories;

- **Piped water on premises** (piped household water connection located in the user`s dwelling, yard or plot).
- **Other improved Drinking water (**public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs or rain water collection).
- **Unimproved Drinking water (**unprotected dug well, unprotected spring, cart with small tank/drum, tanker truck, surface water; river, dam, lake, pond, stream canal)**.**

Examining this issue, the 2007 GHS data reveals that about 66.5% of South African households have access to piped water on premises, 25.4% access other improved sources while 8.1% are accessing unimproved sources. Put together, piped water on premises and other sources slightly exceed 90%. This means that over 90% of households nationwide have some access to safe water. This is close to the 92.7% reported by the Department of Water Affairs and Forestry (DWAF) accessing water above RDP levels in 2007 but way above the 84.5% reported by the census 2001. The difference could mean increase in access over the years. The 2001 census figures are strictly for piped water while the present study includes other safe drinking sources. Though there are considerable differences in the methodology

used, it is evident that there has been a marked increase in the proportion of households accessing safe drinking water between 2001 and 2007.

Table 4.1 Main source of water by gender of the household head

HH main source of water	Gender of head of household		Total
	Male	Female	
piped water on premises	11761	7540	19301
	71.3%	60.1%	66.5%
other improved sources	3776	3600	7376
	22.9%	28.7%	25.4%
unimproved sources	965	1402	2367
	5.8%	11.2%	8.1%
Total	16502	12542	29044
	100.0%	100.0%	100.0%

4.2.1 Access to water by age and sex of the household head

One of the objectives set for this study is to determine how water access varies with the age and sex of the household head. Analysis to this end reveals that male headed households disproportionately access safe drinking sources. 71.3% male as against 60.1% female headed households have piped water on premises. Female headed households dominate for other improved sources (28.7%, 22.9%) and unimproved sources (11.2%, 5.8%). Results presented in Table 4.2a ascertain the existence of a gender gap in household water access in South Africa. This indicates that, though there has been a steady increase in the proportion of households accessing safe water, there has been failure to bridge the gap between male and female headed households.

To investigate the effect of age of the household head on its water access, the age variable was coded into categories. Only household heads age 15 and above considered as household heads. As indicated in Table 4.2a, there are no significant differences in household water access between the differing age groups. This suggests that the age of a household head is not a strong predictor of water availability in the household. A test of association conducted between main water source and age on the one hand and main water source and sex was significant. This however does not mean cause and effect. It is well documented however that that access to water is driven more by economic than socio-economic than demographic factors. The significance of these relationships could therefore be attributed more to chance.

Figure 4: Household main source of water by age group of the household head

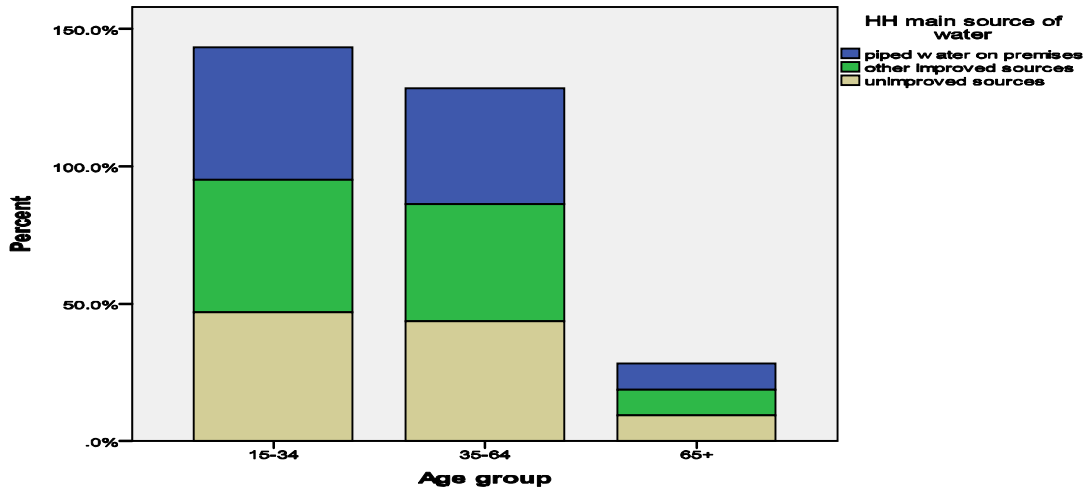


Table 4.2a Results statistics test for Age and main source of water

Gender	Male				Female			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	16.876	.004	.037	.026	3.648	.000	.021	.015
Asymp. Sig.	.002	.095	.002	.002	.456		.456	.456

Table 4.2b Results of statistics test for sex and main source of water

Gender				
Statistics	Chi-square	Lambda	Phi	Cramer`s V
Value	476.924	.020	.128	.128
Asymp. Sig.	.000	.000	.000	.000

4.2.2 Main source of water by population group of the household head

There continue to be inequality in water access to safe water. Unequal service distribution, a legacy of Apartheid is a predominant feature of South Africa`s history. Whites, Indians and Coloureds continue to enjoy better access to safe drinking sources than the Blacks. As indicated in Table 4.3a, over 90% of households headed by both men and women belonging to these population groups have access to piped water on premises. Almost all (98%) of Indian headed household have access to this source. Black households are the least accessing piped water on premise with a mere 62.6% and 53.6% for male and female headed households respectively. They are highest for accessing other improved and unimproved sources. This is consistent with 2009 GHS which reported that 26.5% of Black African population were still using off-site safe water sources compared to only 2% for other

population groups. It points to the persistence of unequal service distribution 15 years after the demise of the Apartheid regime.

The gender gap revealed earlier is seen to replicates within the different population groups but more so within the Black. Table 4.3a illustrates the situation within the different population groups. While the difference favours female headed households for the Coloured and White, the reverse is true for Black headed households. Both male and female Indian headed households have equal (98.3%) access to pipe water. The differences observed in household water access especially for Black is simply a reproduction of gender segregation and inequality between men and women in the Black communities.

These communities are characterised by male dominance in every sphere of life. The relationship between was statistically significant for all statistics. This indicates household water access is related to the population group of the household head. The fact that Black households are the least served points to governmentôs inability to close the gap in water provision created by the discriminatory policies of the Apartheid regime. It also suggest that where access is poor due to complete absence or limited by distance to safe water sources (piped water), people look for alternatives which in most cases are unsafe sources.

Table 4.3a Household main source of water by Population group

Gender	Main source of water	Population Group				Total
		Black	Coloured	Indian	White	
Male	Piped water on premises	7494	2159	405	1674	11732
		62.6%	92.6%	98.3%	95.8%	71.2%
	Other improved sources	3555	141	7	70	3773
		29.7%	6.0%	1.7%	4.0%	22.9%
	Unimproved sources	930	32	0	3	965
		7.8%	1.4%	.0%	.2%	5.9%
Total		11979	2332	412	1747	16470
		100.1%	100.0%	100.0%	100.0%	100.0%
Female	Piped water on premises	5728	1208	113	479	7528
		53.6%	96.8%	98.3%	98.4%	60.1%
	Other improved	3555	35	2	7	3599
		33.3%	2.8%	1.7%	1.4%	28.7%
	Unimproved sources	1396	5	0	1	1402
		13.1%	.4%	.0%	.1%	11.2%
Total		10679	1248	115	487	12529
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.3b Results of statistics test for main source of water and population group

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	1623.598	.314	.222	1254.182	.316	.224
Asymp. Sig.	.000	.000	.000	.000	.000	.000

4.2.3 Access to water by province of residence and gender of the head

This portion of the analysis was intended to check the disparities in water access between urban and rural South Africa informed by WHO and UNICEF, (2010) report which stated that 94% of the urban population of developing regions use improved water sources, while only 76% of rural populations have access to it. The same pattern is observed for the 2007 GHS data. The available data does allow for this as there is no distinction between rural and urban. The spatial variable province allows for the determination of variation of household water access across the nine provinces. The highly urbanised provinces have better access to piped water on premise. Table 4.4a reveals gross variation in household water access across the province. The Western Cape and Gauteng have the highest access to this source with proportions of 88% and above. The least in this category is the Eastern Cape and Kwazulu Natal and Limpopo where only about half male and less than half female headed households have access to piped water on premises. The difference in access between the provinces however is not much.

Provinces with the least access to safe water scored highest for accessing unsafe water sources. While the proportion of households accessing unimproved water in other provinces is generally less than 1%, these three provinces have relatively high proportions for both male and female headed households. Conversely and against all expectations, female headed households in the Eastern Cape showed prominence over male headed households for accessing piped water on premises. This disparity could be explained in terms of the racial constitution of the various provinces. Even though the ócaccess to piped waterô profile in the Eastern Cape was the worst in the country, the number of households with access to piped or tap water increased significantly from 2 56.8% of households access in 2002.

This relationship was statistically significant for both males and females supporting the replication across the provinces of the general trend already observed with male headed households having better access to water than those headed by females. The higher rates of access in the Western Cape and Gauteng could be attributed to the urbanised nature and the

capacity to attract investment relative to the other provinces. It is however difficult to explain the , high rates of access observed in the Northern Cape is difficult to explain given that it is one of South Africa`s poorest and undeveloped provinces. The fact that the Eastern Cape, Kwazulu Natal and Limpopo are lagging in water provision is again attributed to the discriminatory policies of the defunct Apartheid regime against the Blacks. These provinces are majority Black and were therefore neglected by the former regime. It talks of the challenge faced by the government in bridging the gap created service provisionby the former government.

Figure 5: Main source of water by Gender and province of province of residence

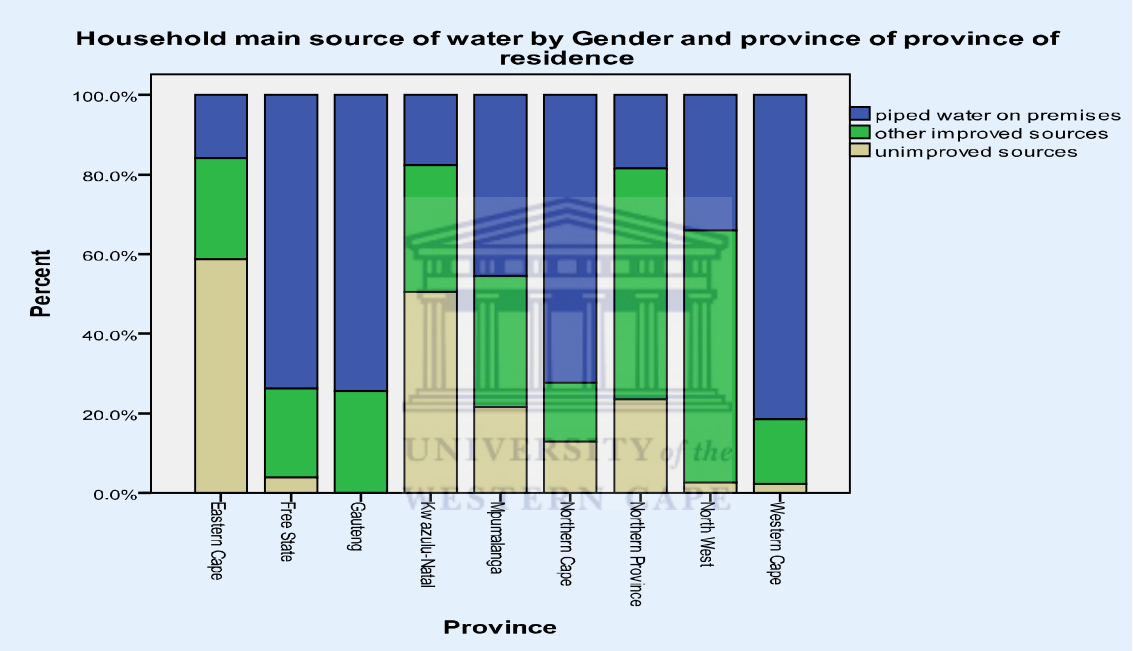


Table 4.4a of statistics for province of residence and main source of water

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	2996.059	.005	.427	.302	3334.651	.012	.516	.365
Asymp. Sig.	.000	.200	.000	.000	.000	.000	.000	.000

4.2.4 Access to water by population group and province of residence of the household head

The persistent inequality in household water access already established along racial lines and across the provinces warrants a closer look at the state of affairs for the different population groups across the provinces. This will allows us to determine whether racial discrimination in

water provision is a localised or nationwide practice. Table 4.4a shows a direct reflection of what is observed at the national level. Black headed households are the least served in all the provinces. In five of the nine provinces; Western Cape, Eastern Cape, Northern Cape, Free State, and Gauteng, all the Indian headed households (100%) have access to piped water on premises. White and Coloured households also have very high (over 90%) and an almost evenly distributed access rates across the nine provinces for this source. The highest access rates for Black headed households is observed in the Northern Cape (92.9%) and very poor access in the Eastern Cape (39.0%), Kwazulu-Natal (43.0%) and Limpopo (41.8%) to piped water.

Relatively small proportions of Black headed households access piped water on premises. Table 4.5a illustrates that they dominate for other improved and unimproved sources in all the provinces. These sources are neither in the dwelling unit or yard implying that members of Black headed households compared to other groups access water from distant sources. The 2009 GHS reveals that 26.5% of Black population are still using off-site (other improved) safe water sources compared to only 2% of other population groups. It further reports that more than half (50%) of Black headed households are accessing improved water source in most provinces but for Limpopo (50.7%), North West (44.7%), Kwazulu-Natal (37.7%) and Eastern Cape (35.5%) that fall below this. This however is small compared to over 90% for other population groups. This relationship proved statistically significant for all population groups and for all statistics used. This affirms racial inequality in household water access is a rather national issue.

Table 4.5 of statistics for water source and population group

Pop group	Chi-square	Lambda	Phi	Cramer`s V
Black	5015.604	.009	.470	.333
Sig	.000	.000	.000	.000
Coloured	123.074	.021	185	.131
Sig	.000	.001	.000	.000
Indian	37.195	.000	.266	.266
Sig	.000		.000	.000
White	35.189	.005	.126	.089
Sig	.004	0.60	.004	.004

4.2.5 Main source of water by level of education and gender of household head

Higher levels of education are known to increases awareness of the dangers associated with the use of unsafe water sources. The expectation is that households headed by educated men and women would have comparatively better access to safe drinking sources. Table 4.6a indicates that differences in access rate according to level of education the head is more for females than men. Contrarily, male households headed with no schooling have better access to piped water on premises and are the least accessing unimproved sources. This is explained by the South African government policy that provides free basic water (25l /p /d) to all households. It prioritises the poor and previously disadvantaged. Again, it could be as a result of the fact that, uneducated males unlike females are engaged in income earning activities. This eliminates the effect of income differential due to differing levels of education.

The pattern observed for female heads is a complete opposite of males. It somewhat agrees with the expectation that higher levels of education increase access to safe water sources. Table 4.6a shows that though not the least, piped water on premises access rates for female headed households with no education is considerably low (58.3%), second only to those with primary education (57.1%). It is also highest for accessing unimproved sources. Female headed households with degree and post graduate education are the highest in this category. There is a no significant difference in piped water access rates for these groups. This suggests that, though access increases with increases in level of educational, there is a level at which increase in educational no longer increases access.

The relationship between main water source and highest level of education of household head was statistically significant. Significance does not necessitate those with higher levels of education having better access to safe drinking sources. It simply confirms the existence of a relationship between these variables. It however points to inequality in earning opportunities resulting from differences in education levels. While most uneducated women tend to be house wives completely dependent on their husbands, their male counterparts do engage in some form of paid work. Though water id provided free to every household, less educated female heads are probably less able to pay water connection fees than the highly educated.

Table 4.6a Household main source of water by education level and gender of the head

Gender	main source of water	Highest Education Level						Total
Male		No Sch	Primary	Secondary	Dip/cert	Degree	Post Grad	
	piped water on premises	1883	3984	5130	104	100	259	11460
		74.2%	70.6%	71.0%	70.3%	66.7%	68.5%	71.2%
	other improved sources	548	1340	1649	32	34	87	3690
		21.6%	23.7%	22.8%	21.6%	22.7%	23.0%	22.9%
	unimproved sources	108	322	450	12	16	32	940
		4.3%	5.7%	6.2%	8.1%	10.7%	8.5%	5.8%
Total		2539	5646	7229	148	150	378	16090
		100.0%	100.0%	100.0%	100.0%	100.0%	100.05	100.0%
Female	piped water on premises	1424	2942	2784	48	49	165	7412
		58.3%	57.1%	63.5%	66.7%	70.0%	69.0%	60.0%
	other improved sources	695	1551	1214	20	15	60	3555
		28.5%	30.1%	27.7%	27.8%	21.4%	25.1%	28.8%
	unimproved sources	322	661	383	4	6	14	1390
		13.2%	12.8%	8.7%	5.6%	8.65	5.9%	11.25
Total		2441	5154	4381	72	70	239	12357
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.6b of statistics for water source and population group

Gender	Male			Female		
Statistics	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	995.923	.045	.032	818.014	.082	.058
Asymp. Sig.	.000	.000	.000	.000	.000	.000

4.2.6 Main source of water by salary, income and gender of household head

Poverty is well documented in the literature as primary barrier to water access. This study hypothesised an association between income and household water access. It also set as objective to determine how household water access varies with income. In this study, respondents were asked state their salaries. Those without salaries were asked to state their income from sources other than salaries. Income and salary are used in this analysis as a proxy to available resources in the household. For the purpose of homogeneity in the analysis, salary and income are analysed differently. There are no significant differences in household water access as a result of salary differentials for both males and female heads.

The differences observed is generally less than 2% overall. The slightly higher proportions of households accessing piped on premises observed for females with low salaries and males with high salaries is attributed to chance. A statistical test for this relationship was significant for male heads but not for female heads. This suggests that unlike men, most women do not earn a salary as most of them do unpaid work in the household.

Table 4.7a Household main source of water by total Salary and gender of the head

Gender	main source of water	Total Salary					Total
		<1500	1501-4500	4501-8000	8001-16000	16001+	
Male	piped water on premises	2215	600	247	138	8561	11761
		69.0%	67.9%	70.4%	68.0%	72.2%	71.3%
	other improved sources	790	214	84	50	2638	3776
		24.6%	24.2%	23.9%	24.6%	22.3%	22.9%
	unimproved sources	204	70	20	15	656	965
		6.4%	7.6%	5.7%	7.4%	5.5%	5.8%
Total		3209	884	351	203	11855	16502
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	piped water on premises	1356	477	191	132	5384	7540
		61.0%	58.5%	60.8%	66.3%	59.9%	60.1%
	other improved sources	619	241	88	45	2607	3600
		27.8%	29.6%	28.0%	22.6%	29.05	28.75
	unimproved sources	249	97	35	22	999	1402
		11.2%	11.9%	11.1%	11.1%	11.1%	11.2%
Total		2224	815	314	199	8990	12542
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.7b Table of Statistics for salary and main source of water

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	23.681	.038	027	6.112	.022	.016
Asymp. Sig.	.003	.003	.003	.635	.635	.635

Before making any conclusive statements, itôs worth considering the second part of the analysis on income. Like for salaried heads, there are no great differences in household water access in terms of income of the household head for both male and female headed households. Though these differences are more than those observed for salary, the trends are inconsistent as well. Chi-square, Lambda, Phi and Cramer`s V were utilized to test for the association between the variables. Like salary, results for income are significant for male but not for female household heads. It would be mistaken to conclude that income and salary is a

predictor of water access in male but not female headed households. Rather, this talks of the fact that men disproportionately earn income either as salaries or otherwise. The small or mere absence of differences in access between households of different salary and income categories is as a result of government policy that provides free basis water to every South African household. This probable has eliminated the effect of income. Any differences would be attributed to other household variables.

Table 4.7c Household main source of water by income and gender of the head

Gender	main source of water	Income					Total
Male		<1500	1505-4500	4501-8000	8001-16000	16001+	
	piped water on premises	329	266	176	174	49	994
		75.1%	61.9%	69.0%	68.5%	71.0%	68.7%
	other improved sources	87	126	72	68	20	373
		19.9%	29.3%	28.2%	26.8%	29.0%	25.8%
	unimproved sources	22	38	7	12	0	79
		5.0%	8.8%	2.7%	4.7%	.0%	5.5%
Total		438	430	255	254	69	1446
		100.0%	100.0%	100.0%	100.05	100.0%	100.0%
	piped water on premises	149	203	165	131	25	673
		60.6%	68.4%	65.2%	63.6%	56.8%	64.3%
	other improved sources	69	61	65	50	13	258
		28.0%	20.5%	25.7%	24.3%	29.5%	24.7%
	unimproved sources	28	33	23	25	6	115
		11.4%	11.1%	9.1%	12.1%	13.6%	11.0%
Total		246	297	253	206	44	1046
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.7d of statistics for income and main source of water

Gender	**Male**				**Female**			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	24.288	.017	.137	.097	8.049	.008	.088	.062
Asymp. Sig.	.002	.312	.002	.002	.429	.428	.429	.429

4.2.7 Main source of water by main occupation and gender of the head

Earnings are known to vary with occupation. Occupation here refers to the main activity of the household head. Like income and salary, it is used as a proxy to household resources considering that salary and or income vary with occupation. Households headed by both

males and females of differing occupation groups do not differ greatly in access to safe water sources. Male headed households in the agricultural and craft related trade (71.2%) are highest accessing piped water on premises while those in elementary occupation and domestic work were the lowest for this category (67.0%) and highest (7.55%) for accessing unimproved sources. The trend for female headed households is a complete opposite of that observe for male heads. Legislators, senior officials, managers and professionals are ranked first (65.2%) and elementary and domestic professions least (59.2%) for accessing piped water on premises as expected.

The slightly higher rates of access by males in agricultural and craft related trade is explained by the fact that, agriculture in South Africa is mostly on industrial scale. Household heads operating in this sector are the wealthy Whites favoured by the former regime. Their high access rate is mainly a legacy of the past discriminatory government policies. For females, the difference is as results of the gap in terms knowledge (education) and income that exist between professional women and their counterparts in other occupations. This however is not statistically significant as a test of association failed to establish any statistically relationship between these variables. There is therefore no discrimination in terms of the occupation of the household head. Household's access to safe water is not predetermined by its resources for which occupation like salary and income is used as a proxy. It is strictly a function of the effectiveness of the policy that provides for free basic water already seen to upset the influence of economic factors on household water access.

Table 4.8a Table of statistics for occupation and main source of water

Gender	**Male**				**Female**			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	12.351		.043	030	8.536	.009	. .042	.030
Asymp. Sig.	.136		.136	.136	.383	.242	.383	.383

Table 4.8b HH main source of water by main occupation and gender of the head

Gender	HH main source of water	Main Occupation					Total
Male		legislators, senior officials and mangers	technical and associate profession	clerical, service, shop and market sales	Skilled agric, fishery, craft and related trades	elementary occup, domestics workers	
	piped water on premises	452	649	885	812	1776	4574
		68.4%	68.8%	68.4%	71.2%	67.0%	68.4%
	other improved sources	175	231	331	263	674	1674
		26.5%	24.5%	25.6%	23.1%	25.4%	25.0%
	other improved sources	34	63	78	65	199	439
		5.1%	6.7%	6.0%	5.7%	7.5%	6.6%
Total		661	943	1294	1140	2649	6687
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	piped water on premises	322	535	631	438	1012	2938
		65.2%	62.9%	62.0%	62.0%	59.2%	61.5%
	other improved sources	121	220	279	189	484	1293
		24.5%	25.9%	27.4%	26.7%	28.3%	27.1%
	unimproved sources	51	95	107	80	213	546
		10.3%	11.2%	10.5%	11.3%	12.5%	11.4%
Total		494	850	1017	707	1709	4777
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.2.8 Household main source of water by employment status and gender of the head

It was hypothesised that there is a relationship between employment status of the household head and water access. The 2007 GHS data classifies household heads as either non active, employed or unemployed. There are no significant differences in household water access between households headed by men and women in different employment categories. Table 4.9b indicates that male headed households have better access to this source than those headed by females. While the trends for male seem to deviate from the expected relationship, the female headed households are in accord. Non active male headed households have the highest access rate (73.9%) to piped water on premises. Unemployed female heads have the highest rate of access (61.5%). While employment status does not seem to influence water access for male headed households, it is a very important determinant for those headed by female.

A test of association established a statistically significant relationship between employment status and main water source for both sexes. Employment status of the household head is therefore an important factor for household water access. It is however contrary to the trends portrayed in table 4.9b. The minute differences in access rates between male and female headed households of different employment categories is due to the policy of free basic water adopted by the South African government. Like with other economic variables under study, the effect of employment status on household water access has been eliminated.

Table 4.9a Household main source of water by employment status and gender

Gender	main source of water	Official employment status			Total
Male		Not active	Employed	Unemployed	
	piped water on premises	5967 73.9%	4575 68.4%	1219 70.0%	11761 71.3%
	other improved sources	1691 21.0%	1675 25.0%	410 23.5%	3776 22.9%
	unimproved sources	412 1%	441 6.6%	112 6.4%	965 5.8%
Total		8070 100.0%	6691 100.0%	1741 100.0%	16502 100.0%
	piped water on premises	3566 59.8%	2939 61.5%	1035 57.4%	7540 60.1%
	other improved sources	1761 29.6%	1294 27.1%	545 30.2%	3600 28.7%
	unimproved sources	632 10.6%	546 11.4%	224 12.4%	1402 11.2
Total	5959 100.0%	4779 100.0%	1804 100.0%	12542 100.0%	100.0%

Table 4.9b Table of statistics for employment status and main source of water

Gender	Male				Female			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	58.255	.002	.059	.042	15.662		.035	.025
Asymp. Sig.	.000	.321	.000	.000	.004		.004	.004

4.2.9 Household main source of water by type of living quarters the head

Household water access is known to vary over space. It does so not only between different geographical locations but also between living quarters in the same locality. The 2007 GHS classify living quarters into two categories; private and workers hostels. The greater majority of South African households are living in private dwellings. As in indicated in Table 4.10b, households in workers hostels disproportionately access safe water sources. An amazing 86.5% male and 85.6% female headed households in workersô hostel have access to piped water on premises. For private residence the access rate for this source is 70.6% and 59.8% for males and female headed households respectively. While there is no significant difference (1.1%) in male and female headed household access rates for worker`s hostels, that for households in private dwellings is as high as 10%. The relationship was found to be statistically significant for both male and female headed households.

Worker`s hostels are owned and run by institutions for their employees. The construction of these hostels takes into consideration welfare and basic needs of these workers including water. Contrarily, private dwellings are owned by individuals and the services provided are not only determined by need but by the means to do so. Institutions, organisations, and companies can afford the huge amounts needed for this purpose. Private individuals especially in the developing world most often are unable to raise the money needed for this purpose. As a result, they resort to other alternative sources. These are most often distant or unsafe sources. It explains why private dwellings have high rates of access to other improved sources. The relatively better access to safe sources enjoyed by male headed households in private dwellings is due to the impoverished nature of those headed by their female counterparts. This is accounted for by their low income levels accentuated by their large household sizes.

Table 4.10a Table of statistics for type of living quarters and main source of water

Gender	Male			Female		
Statistics	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	80.734	.071	.071	40.879[b]	.058	.058
Asymp. Sig.	.000	.000	.000	.000	.000	.000

Table 4.10b HH main source of water by type of living quarters and gender of the head

Gender	HH main source of water	Type of living quarters		Total
		Private dwelling	Workers' hostel	
Male	piped water on premises	10981	576	11557
		70.6%	86.5%	71.3%
	other improved sources	3636	80	3716
		23.4%	12.0%	22.9%
	unimproved sources	931	10	941
		6.0%	1.5%	5.8%
Total		15548	666	16214
		100.0%	100.0%	100.0%
Female	piped water on premises	7290	125	7415
		59.8%	85.6%	60.1%
	other improved sources	3526	18	3544
		28.9%	12.3%	28.7%
	unimproved sources	1379	3	1382
		11.3%	2.1%	11.2%
Total		12195	146	12341
		100.0%	100.0%	100.0%

4.2.10 Household main source of water by dwelling type of the household head

There are great differences in access between the different dwelling types. Access to water increases with the quality of the dwelling unit as expected. The differences in access rate tend to narrow as the quality of the dwelling increases. Table 4.11a illustrates the situation in different types of housing unit. Households headed by both men and women in Flat/Apartment/simplex/duplex/triplex have very high (95%) and almost equal access to piped water on premises. Those in Traditional dwellings have the lowest access rates. Only 16.9% male and 14.3% female headed households had access to piped water on residence. They are seconded by Informal with 60.8%male and 62.2% female headed households respectively. Table 4.11a shows that while Traditional dwelling was the least accessing piped water on premise, it scored highest for other improved and unimproved sources. Households occupying these dwelling units do not only access unsafe water sources but travel long distance to collect water.

The pattern observed suggest an association between water sources and dwelling type. This was confirmed by a test of association for both male and female headed households. These results illustrate that households living in high quality dwelling tend to have better access to

water than those in poor housing conditions. The household`s ability to afford water as measured by income is mirrored by its dwelling unit. The significant low rate of access for Traditional dwelling is due to the fact that they are in rural areas which attract very little investment in the water sector. Again, most households in these areas still use traditional sources like stream, springs and wells.

Table 4.11a Household main source of water by type of main dwelling and gender

Gender	HH main source of water	Main dwelling type					Total
Male		Brick structure stand/yard/farm	Traditional Dwelling	Flat, Apartment, simplex, duplex	Informal Dwelling	Room/flatlet in backyard	
	piped water on premises	8099	292	737	1209	839	11176
		79.1%	16.9%	95.0%	60.8%	80.0%	70.8%
	other improved sources	1834	856	32	767	173	3662
		17.9%	49.6%	4.1%	38.5%	16.5%	23.2%
	unimproved sources	302	578	7	14	37	938
		3.0%	33.5%	.9%	.7%	3.5%	5.9%
Total		10235	1726	776	1990	1049	15776
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	piped water on premises	5321	14.3%	483	672	490	7301
		69.9%		94.0%	62.2%	76.8%	59.9%
	other improved sources	1887	1095	23	397	116	3518
		24.8%	46.9%	4.5%	36.8%	18.2%	28.9%
	unimproved sources	408	906	8	11	32	1365
		5.4%	38.8%	1.6%	1.0%	5.0%	11.2%
Total		7616	2336	514	1080	638	12184
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.11b Table of statistics for main dwelling type and main source of water

Gender	Male				Female			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	4389.230	.083	.527	.373	3510.275	.133	.537	.380
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.000	.000

4.2.11 Household main source of water and dwelling ownership

Like dwelling type, it was hypothesised that dwelling ownership (tenure) as determinant of the availability of water in a household. The GHS 2007 grouped tenure status into six categories. There is a fairly high rate of access to piped water on premises for both male and female headed households of all tenure status. Table 4.12b shows that Owned and not fully paid off have the highest access rate of 98.3% to piped water on premises for both male and

female headed households. There are also no differences in access rate for male and female heads in rented dwellings. The lowest in this category is the Owned and fully paid off with access rates of 6301% and 53.6% for male and female heads respectively. Males disproportionately enjoy have better access rates to piped on premises. While there are no differences in male and female for those with high access rates, it widens with decrease in access rate. The difference is highest for owned and fully paid (10%) which also has the highest access to unsafe sources.

Table 4.12b illustrates that contrary to expectations, households in owned and fully paid dwellings have low rates of access to safe water sources for both male and female headed households. Members of these households could be accessing unsafe water sources a distant away from the dwelling unit. Testing for association, the relationship was statistically significant for both males and females. This is an indication that housing ownership influences household water access. The distortion observed is due to the fact most houses in South Africa are bought on hire purchase already supplied with water. The payment of these bonds takes quite some time. This explains why Owned and not fully paid off have the highest access rate. The category Owned and fully paid constitute mainly of those in self constructed houses who because of financial constraints may have postpone the installation of water to a later date. This could be especially true where there is access to a public tap or other sources considered safe in the vicinity of the dwelling unit.

Table 4.12a Table of statistics for dwelling ownership and main source of water

Gender	**Male**				**Female**			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	1165.896[a]		.266	.188	914.386[b]		.270	.191
Asymp. Sig.	.000		.000	.000	.000		.000	.000

Table 4.12b Household main source of water by dwelling ownership and Gender

Gender	main source of water	Dwelling ownership						Total
Male		Owned and fully paid off	Owned, but not yet fully paid off	Rented	Occupied rent-free A	Occupied rent-free B	Occupied as a boarder	
	piped water on premises	6375 63.1%	1111 98.3%	2735 86.7%	975 73.8%	483 70.4%	70 84.3%	11749 71.3%
	other improved sources	2882 28.5%	15 1.3%	394 12.5%	299 22.6%	171 24.9%	11 13.3%	3772 22.9%
	unimproved sources	852 8.4%	4 .4%	27 .9%	47 .3%	32 4.7%	2 2.4%	964 5.8%
Total		10109 100.0%	1130 100.0%	3156 100.0%	1321 100.0%	686 100.0%	83 100.0%	16485 100.0%
Female	piped water on premises	5264 53.6%	295 98.0%	1296 86.5%	372 77.5%	263 69.5%	46 93.9%	7536 60.1%
	other improved sources	3220 2.0%	6 12.3%	184 19.4%	93 24.3%	92 4.1%	2 28.7%	3597 2.0%
	unimproved sources	1341 10.7%	0 .0%	18 .1%	15 .1%	24 .2%	1 .0%	1399 11.2%
Total		9825	301 100.0%	1498 100.0%	480 100.0%	379 100.0%	49 100.0%	12532 100.0%

4.2.12 Main cause of piped water interruption by gender of the household head

The reliability of water supply is crucial to every household. It makes the difference between access and none access. There are eight main causes of household water interruption ranging from burst piped to vandalism. As indicated in Table 4.13, four of these were found to be major causes while three were considered minute. Bust pipes is ranked first accounting for 45.7% of the interruptions overall. This was followed by general maintenance (28.4%), not enough water due to high demand (11.6%), and pump not working (9.2%) in that order. Interruptions as a result of water delivered at fixed times, cut off due to non payment of services and vandalism are considered minimal and together accounting for less than 6% of all causes of water interruptions.

Controlling for gender of the household head, no major differences were found between households headed by males and females except. Male headed households however were

found to have 3.3% more interruptions as a result of burst pipes than those headed by females. The minute differences observed are attributed to chance. It could therefore be concluded that male and female headed households are indiscriminately affected by water interruption.

Table 4.13 Causes of piped water interruptions by gender of the household head

Causes of piped water interruptions	Gender of head of household		Total
	Male	Female	
Burst pipes	2032	1658	3690
	47.2%	43.9%	45.7%
Pump not working	369	377	746
	8.6%	10.0%	9.2%
General maintenance	1238	1055	2293
	28.8%	28.0%	28.4%
Not enough water in the system (demand too high)	439	477	916
	10.2%	12.6%	11.3%
Water only delivered at fixed times	102	107	209
	2.4%	2.8%	2.6%
Non-payment for services (cut-off)	53	42	95
	1.2%	1.1%	1.2%
Vandalism	68	57	125
	1.6%	1.5%	1.5%
Total	4301	3773	8074
	100.0%	100.0%	100.0%

4.2.13 Distance to main source of water by gender and population group of the household head

A household is considered to have access to water if its main source of drinking water is within 200m of the dwelling unit. There are great differences in distance household members of different groups travel to collect water. Table 4.14a illustrates the situation in different population group. But for White, members of female headed households of all population groups disproportionately travel long distances to collect water. 52.6% male as against 45.5% female headed household access water within 200m of their dwelling unit. This situation is reverse from distances of 201m and 5oom and above. Women in South Africa have been said to collectively walk the equivalent distances of 16 times to the moon and back daily collecting water for their families. A survey of 45 developing countries between 2005 and 2008 show that in almost two-thirds of the households, women are the primary collectors of water (MIC and DHS, 2005-2008; ADB, 2009).

While a greater majority of male and female headed households of the other groups access water in close proximity to the dwelling unit (less than 200m), Black men and women have very low access rates within range. All Indian male headed (100%) as against 50% female headed households access water within less than 200m from the dwelling unit. There are great disparities between male and female headed household with half (50%) of the female headed households covering distances of above 1Km. Of all the population groups, White travel the shortest distances to collect water. Only 10% male and 0% female headed White households access water beyond 501m away from the household.

The picture becomes clearer when we look at the average distance cover by household members to collect water. For this purpose the average distance was computed for gender and population group using the following formula;

$$\bar{d} = \frac{\sum xf}{\sum f}$$

Where **x** is the class mid point and **f** the class frequency

Table 4.14b Mean distance covered to water sources by gender of the HH head

Distance	x (Km)	Freq male	xf	Freq female	xf
<200m	.1	2219	221.9	2128	212.8
201-500	.15	1299	155.88	1528	229.2
501-1Km	.25	428	107	662	16.5
>1km-3km	1.5	260	390	346	519
Total		4205	874.78	4664	977.5

Male 0.208 Km (208m), Female 0.210 Km (210m)

Table 4.14c Mean distance covered to water sources by population group of the head

Distance	x (Km)	Freq Black	xf	Freq Coloured	xf	Freq Indian	xf	Freq White	xf
<200m	.1	4207	420.7	119	11.9	4	.4	15	1.5
201-500	.15	2788	418.2	35	5.25	0	0	4	.6
501-1Km	.25	1084	271	5	1.25	0	0	1	.25
>1km-3km	1.5	615	918	0	0	1	1.5	1	1.5
Total		8694	2027.9	155	18.4	5	1.9	21	3.85

Black, 0.233Km (233m), Coloured 0.119Km (119m), Indian 0.38Km (380m), White, 0.183Km (183m)

Results presented in Table 4.14b (mean distances to water source by gender) and 4.14c (mean distances to water source by population group) show that there are no significant differences in the distances travelled by members of male (0.208km) and female (0.210 km) headed HHs. Regarding the population groups, the Indian (0.233km) cover the longest distances followed by the Black (0.233km), the White (0.183km) and the Coloured (0.119km) in that order. Distance of water source from the dwelling unit discriminates for population group but not for sex.

4.2.14 Distance to the main source of water by gender and province of residence

Having determined the variation in distance covered by members of households headed by men and women of different population groups, it is important to understanding how it varies across the national territory. The GHS 2007 data only allows for comparison between provinces as there is no differentiation between rural and urban. Table 4.15a shows how distance to household main water source relates with gender across the nine provinces. There is a great inequality among provinces in terms of distances travel by both male and female headed households to collect water. While there are disparities among the provinces, there is also seen to be inequality between male and female headed households within the provinces. Female headed households generally access water sources comparative further away from the dwelling unit.

But for Kwazulu-Natal with 37.9% male and 32.7% female headed households and Limpopo with 49.5% for female headed households, more than half (above 50%) of both the male and female headed households access water within 200m of their dwelling unit. While households in the Western Cape, Northern Cape, Gauteng and Free State access sources in close proximity to the dwelling unit, those in Kwazulu Natal, Eastern Cape, Mpumalanga and Northwest access distant sources. This is particular serious in Kwazulu Natal and Eastern Cape. However, the observed decrease in access rate away from the dwelling unit suggests that the majority of the households fetch their water within relatively shorter distances. Overall, female headed households dominate for sources further away from the dwelling unit (from 201m-500m) across all the nine provinces. It could be said therefore that members of households headed by women travel longer distances in most provinces to collect water.

Table 4.15b Table of statistics test for main water sources and distance

Gender	Male				Female			
Statistics	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	16907.614	.591	1.012	.716	13580.706	.580	1.041	.000
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.736	.000

4.2.15 Perception of water by gender and population group of the head

Different people perceive water differently and this is dependent on a number of factors. The expectation is that households would access sources they consider safe for drinking. This however is not always the case as there are limitations imposed on them either by distance, inability to afford the cost in terms of water bills or connection cost or a mere absence of these sources. A greater majority (90.5%) of both male and female headed households generally perceive their water sources as save for drinking. Male household heads have a higher perception of water as safe than their female counter parts.

Table 4.16 indicates that 98.2% male household heads consider their water sources safe as against 88.2% for female household heads. Of those household heads who answer no (water unsafe), 7.8% are male and 11.8% female household heads. Judging from the figures in Table 4.16, the temptation is to conclude that most households have access to safe drinking sources. This however is just perception and it is but obvious that they perceive their water sources as save as it is the best they can afford under the present circumstances. The relatively high perception of water sources as safe by male householdôs heads could be a result of their relatively better access to safe water established earlier. Alternatively, it could be linked to the fact that household water collection and use befalls women. Men most often are more concern with payment of water bills. Their knowledge of the quality of water used by the household is comparatively limited. Their higher perception rates could be a reflection of the knowledge gap between men and women on household water quality.

Table 4.16 Perception of water as safe to drink by sex of the household head

Is the water from main source safe to drink	Gender of head of household		Total
	Male	Female	
Yes	15306	11121	26427
	92.2%	88.2%	90.5%
No	1290	1494	2784
	7.8%	11.8%	9.5%
Total	16596	12615	29211
	100.0%	100.0%	100.0%

4.2.16 Perception of water as safe by gender and population group of head

South Africa provides a clear example of an unequal service distribution. Water is no exception as seen across the different segments of society. Variation in the perception of drinking water sources as safe for both male and female headed households closely correlates with racial groupings. Like for gender, all population groups have considerably high perception of their water sources as safe. As expected, of all the groups, Black has the lowest rates while Indian is highest for both sexes. This agrees to the fact that water policy under the Apartheid government was anything but equitable. Access to services including domestic water was extremely polarized between white and black areas (Rose, 2005).

Table 4.17 illustrate variation in perception among the different population groups. But for the Indians with a perception rate of 97.3 for male and 100% for female heads, and Coloured with 96.5% and 97.3% for male and female heads respectively, males have higher perception rates. The differences between the sexes however are very minimal. This shows that water sources for a majority of the households is of acceptable quality. While Black headed households are last and fall below the national average of 90.5%, they are highest for perceiving their main water sources as unsafe. Using perception as a proxy for water quality it could be concluded that Black headed households have comparatively poor water quality.

Table 4.17 Perception of water as safe by gender and population group of the head

Gender	Is the water from main source safe to drink	Population group of head of household				Total
		Black	Coloured	Indian	White	
Male	Yes	10932	2265	400	1677	15274
		90.8%	96.5%	97.3	95.0	92.2%
	No	1108	83	11	88	1290
		9.2%	3.5%	2.7%	5.0%	7.8%
Total		12040	2348	411	1765	16564
		100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	9308	1223	116	461	11108
		86.7%	97.3%	100.0%	94.3%	88.1%
	No	1432	34	0	28	1494
		13.3%	2.7%	.0%	5.7%	11.9%
Total		10740	1257	116	489	12602
		100.0%	100.0%	100.0%	100.0%	100.0%

4.2.17 Perception of water as safe by gender and province of residence of the head

Having already determined the variation of water perception with gender and ethnicity, it is important to consider variation over space. Urban areas generally have better access to safe water sources than the rural areas (World Bank, 2004). WHO and UNICEF (2010) reported that 94% of the urban and only 76% of rural populations have access to safe water. The 2007 does not allow for rural urban comparison. Province is the spatial variable uses for this purpose. Considering perception as a direct reflection of water quality and service, there is seen to be great inequality across the national territory. Household perception of water as safe is generally high (above 80%) for both male and female headed households in all the nine provinces.

Table 4.18 illustrate the situation across the provinces. High perception of water as safe is seen to correlate with highly urbanised provinces. Gauteng and Western Cape, top the perception list. Lowest though still considerably high is the Eastern Cape and Kwazula-Natal. These two provinces are also highest perceiving household water sources as unsafe. Though the 2007 GHS makes no distinction between rural and urban, it is documented that these are South Africa`s least urbanised provinces and host the bulk of its rural population. It is not by chance therefore that they have the lowest rates of household water perception as safe. Rural areas do not only fail to draw the attention of national authorities but also do not compete

fairly for public investment funds (Soares, et al. 2002). These areas therefore are not prioritised in water supply programs and schemes.

Controlling for gender, household perception of water as safe do not seem to deviate much from what is observed at the national level. Except for Western and Northern Cape with97.3%, and98.5% and 94.6% and 95.4% for male and female heads respectively, male headed households have relative higher perception rates of water sources as safe. Both male and female headed households in Gauteng have equal perception (99%) of water a safe. Gender of household head is seemingly not a very strong determinant of water perception evident by the insignificant differences observed between sexes. The variation among provinces could be attributed to the differing water sources and quality of services provided by the utilities (municipalities) in the different provinces. It could as well simply be a reflection of the past inequitable service provision policy of the Apartheid regime that has not been successfully dealt with.

Table 4.18a Perception of water as safe by gender and province of residence

Gender	Is the water from main source safe	Province									Total
		WC	EC	NC	FS	KZN	NW	G	M	L	
Males	Yes	2184	1664	1134	1302	3045	1307	2295	1127	1248	15306
		97.3%	85.0%	94.6%	94.3%	86.2%	97.2%	99.0%	88.1%	93.3%	92.2%
	No	61	293	65	79	489	38	23	152	90	1290
		2.7%	15.0%	5.4%	5.7%	13.8%	2.8%	1.0%	11.9%	6.7%	7.8%
Total		2245	1957	1199	1381	3534	1345	2318	1279	1338	16596
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Female	Yes	1022	1526	620	871	2789	1068	1063	786	1376	11121
		98.5%	80.8%	95.4%	92.7%	78.6%	96.9%	99.3%	90.6%	91.2%	88.2%
	No	16	362	30	69	761	34	7	82	133	1494
		1.5%	19.2%	4.6%	7.3%	21.4%	3.1%	.7%	9.4%	8.8%	11.8%
Total		1038	1888	650	940	3550	1102	1070	868	1509	12615
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 4.18b Table of statistics for perception of water quality and main source of water

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	5546.121	.115	.580	.410	5707.285	.222	.675	.477
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.000	.000

4.2.18 Access to municipal water by gender and population group

In South Africa like in most African countries, water supply is still the primary responsibility of the government more so as part of the ongoing efforts to correct the imbalances of the past. This has led to the adoption of a policy of free basic water supply (25l/p/d) to every South African household through municipalities. Though provided free to every household, not all have access to municipal water. There is generally high access to municipal water for both male and female headed households of the different population groups. According to Statistics South Africa (Stats SA), (2009), the rate of access to municipal sources (piped water) increased from 74. 5% to 83.3% between 2007 and 2009. The 73.2% revealed by the 2007 GHS data is in agreement to the municipal access rates reported by Stats SA.

Table 4.19b shows very minute differences in municipal water access rates between male and female headed households for all population groups. This suggests that gender is not a strong predictor of municipal water access. Though small, female have better access to municipal sources than male headed households. This confirms the fact that more women than men access distant sources as most municipal water sources is of site. The near equal access to municipal sources gender was also observed for population group but for Black with 69.8% and 65.9% for male and female headed households respectively. Indian headed households like for piped water is highest for accessing municipal sources. While access rate to municipal water for other groups are considerably high (over80%), that for Black is relatively low. They are least connected to municipal water networks and therefore deficient in access to safe water since this is primary source safe water in Black communities. This explains why have very high access rates to unimproved sources and lower rates of perception of their water sources as safe.

Table 4.19a Table of statistics for access to municipal water and population group

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	310.985	.137	.137	580.376	.215	.215
Asymp. Sig.	.000	.000	.000	.000	.000	.000

Table 4.19b Access to municipal water by gender and population group of the head

Gender	Access to municipal water	Population group of head of household				Total
Male		Black	Coloured	Indian	White	
	Yes	8392	1852	389	1481	12114
		69.8%	78.9%	94.2%	84.1%	73.2%
	No	3635	496	24	280	4435
		30.2%	21.1%	5.8%	15.9%	26.8%
Total		12027	2348	413	1761	16549
		100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	7073	1157	113	469	8812
		65.9%	92.1%	97.4%	95.9%	69.9%
	No	3665	99	3	20	3787
		34.1%	7.9%	3.6%	4.1%	30.1%
Total		10738	1256	116	489	12599
		100.0%	100.0%	100.0%	100.0%	100.0%

4.2.19 Access to municipal water by gender and province of residence

Municipalities as an arm of the national government are charged with the task of household water provision. They are also charged with implementing the government policy of free basic water to all. The determination of household connection to municipal water network would give an idea of their performance in this regard. Stats SA (2009) reported a steady increase in the proportion of households connected to municipal water network that stagnated in 2008. Informed by this, and the already observed marked differences in gender and population group, it is necessary to determine how well provinces (municipalities) are doing in this regard. Like gender and population group, but for a few exceptions, there are very minute differences in access to municipal water across the provinces

Table 4.20a of a show a generally high (above 70%) household access rates to municipal water in most provinces. The highest access rates are observed in Gauteng where an amazing 91.5% male and 93.9% female headed households are access municipal water. Other provinces with equally high rates of connection to this network are the Western Cape, Free State and Northern Cape. Eastern Cape and Kwazulu Natal have the lowest rates falling below the national average of 73.2%. It would be mistaken to judge municipal performance in these provinces on this basis. However, it explains earlier findings which put these

provinces as those with the lowest rate of access to safe drinking sources. It also justifies why they had the lowest rates of perception of water as safe.

Table 4.20a Access to municipal water by gender and province of residence of the head

Gender	Municipal water	Province									Total
Male		WC	EC	NC	FS	KZN	NW	G	M	L	
	Yes	1817	1402	868	1150	2008	920	2117	895	963	12140
		80.9%	71.6%	72.8%	83.3%	56.8%	68.5%	91.5%	70.0%	72.0%	73.2%
	No	430	555	324	230	1525	423	196	383	375	4441
		19.0%	28.4%	27.2%	16.7%	43.2%	31.5%	8.5%	30.0%	28.0%	26.8%
Total		2247	1957	1192	1380	3533	1343	2313	1278	1338	1658
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Female	Yes	960	1287	593	883	1658	731	1003	592	1117	8824
		95.4%	68.1%	91.4%	94.0%	46.7%	66.6%	93.9%	68.2%	73.9%	70.0%
	No	79	602	56	56	1892	367	65	276	395	3788
		7.6%	31.9%	8.6%	6.0%	53.3%	33.4%	6.1%	31.8%	26.1%	30.0%
Total		1039	1889	649	939	3550	1098	1068	868	1512	12612
		100%	100%	100%	100%	100%	100%	2100%	100%	100%	100%

Table 4.20b Table of statistics for access to municipal water and population group

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	1043.345	.006	.251	.251	1876.077	.018	.386	.386
Asymp. Sig.	.000	.090	.000	.000	.000	.000	.000	.000

4.2.20 Rating of municipal water services by the gender and population group

The appreciation of water services like most economic goods is often in terms of payment; in this case water bills. Access to municipal water does not necessarily entail satisfaction with the services provided. It could be due to a mere absence of an alternative source or the inability to access other available sources limited by the means to do so. This is an attempt to measure household satisfaction with municipal water service and quality. It is also a better way of understanding the differences in municipal performance in relation to water service delivery. Overall a greater majority of the households headed by both men and women of the different population group are satisfied with municipal water services.

Table 4.21 shows Black is the least satisfied as evident by their low rating of municipal water as good. In total, 70.7% male as against 66.6% female headed households rated municipal water service good, 21.6% average and 7.7% rated it poor. The gender differences within the population groups are inconsistent. Male heads are more appreciative in others while in others it is the reverse. The difference in household satisfaction with municipal water services between the population groups could be a reflection of the differences in access observed earlier. It could also be due to the difference in the roles of men and women in the household. The relatively great difference Black male and female household heads satisfaction is attributed to this. Women are most often are solely responsible for water use and management in the household. Men consequently would not be aware of the frequency of water disruptions and irregularities suffered by the households. Neither would they better appreciate the inconveniences it causes. Rating of municipal water services by the female household heads could therefore be a more realistic picture of services provided by the municipalities. The observed low rating of municipal services by Black men and women is an indication of the poor level of services provided in the Black communities and the unequal roles of men and women in the traditionally Black households.

4.2.21 Rating municipal water services by gender and population group

Gender	Rating municipal water	Population group of head of household				Total
Male		Black	Coloured	Indian	White	
	Good	5702	1365	314	1164	8545
		68.1%	73.7%	81.1%	78.6%	70.7%
	Average	1968	365	58	224	2615
		23.5%	19.7%	15.0%	15.1%	21.6%
	Poor	705	121	15	92	933
		8.4%	6.5%	3.9%	6.2%	7.7%
Total		8375	1851	387	1480	12093
		100.0%	100.0%	100.0%	100.0%	100.0%
Femal	Good	4546	843	90	373	5852
		64.4%	73.1%	80.4%	79.7%	66.6%
	Average	1779	222	18	70	2089
		25.2%	19.3%	16.1%	15.0%	23.8%
	Poor	730	88	4	25	847
		10.3%	7.6%	3.6%	5.3%	9.6%
Total		7055	1153	112	468	8788
		100.0%	100.0%	100.0%	100.0%	100.0%

4.21 Rating of municipal water services by gender and province of residence

As already established the rating given of municipal water services is a reflection not only of household satisfaction but also mirrors the quality of service provided. Because these services are provided by different municipalities across the national territory, they are bound to differences. It is expected that these differences would be expressed through household rating of municipal water services. This is better understood when the spatial variation in household rating is considered. Table 4.22 shows great variation in household rating of water services as good across the provinces. Overall household rating of services in most of the provinces for both male and female headed households fell below the national average of 70.75 for males and 66.6% for female household heads.

While Gauteng scored highest for rating municipal water service as good for both male and female headed households, the reverse holds true for Limpopo. Eastern Cape and Kwazulu Natal are among the provinces with very low rating of municipal water as good. Table 4.22 show that high ratings coincided with highly urbanised provinces while low ratings coincide with the less urbanised. This suggests that relatively more attention is given to the urban areas and that urban residents enjoy better services. If observed differences in rating of the municipal water services are a reflection of the quality of the services provided, it could imply differences in municipal water services. Some municipalities mostly in the urban areas are offering better services to the communities than others. The general decreased in proportions down the rating scale means that fewer households consider municipalitiesô water services as poor. Municipal water services throughout the country are generally of acceptable standard to the communities they serve.

Ta1ble 4.22 Rating municipal water services by gender and province of residence

Gender	Rating municipal water	Province									Total
Male		WC	EC	NC	FS	KZN	NW	G	M	L	
	Good	1380	941	619	781	1428	623	1713	545	536	8566
		76.3%	67.2%	71.1%	67.9%	71.3%	67.9%	80.8%	60.8%	56.4%	70.7%
	Average	329	360	190	250	479	204	288	227	293	2620
		18.2%	25.7%	21.8%	21.7%	23.9%	22.2%	13.6%	25.3%	30.8%	21.6%
	Poor	100	99	62	120	97	91	118	124	122	933
		5.5%	7.1%	7.1%	10.4%	4.8%	9.9%	5.6%	13.8%	12.8%	7.7%
Total		1809	1400	871	1151	2004	918	2119	896	951	12119
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Female	Good	711	785	412	589	1168	473	799	343	582	5862
		74.8%	61.0%	69.5%	66.7%	70.7%	65.0%	79.6%	57.9%	52.4%	66.6%
	Average	166	405	128	186	388	163	140	153	362	2091
		17.5%	31.5%	21.6%	21.1%	23.5%	22.4%	13.9%	25.8%	32.6%	23.8%
	Poor	74	96	53	108	96	92	65	96	167	847
		7.8%	7.5%	8.9%	12.2%	5.8%	12.6%	6.5%	16.2%	15.0%	9.6%
Total		951	1286	593	883	1652	728	1004	592	1111	8800
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

4.3 Household willingness to pay for water services

This section of the analysis focuses on household willingness to pay for water services. Willingness to pay is a concept of economic value is defined as maximum units of goods or services that a person is willing to sacrifice in order to get other goods or services (Harapap & Hartono, 2007). It determines the amount of money a consumer will pay for the supply of water. Cost recovery in local infrastructure development is now crucial for local governments. Willingness to pay has a role in assessing acceptable water charges to users upon which water policy can be developed with the confidence of achieving cost recovery. Willingness to pay for water is analyzed to determine who is able to pay for water and how it varies according to household demographic, socioeconomic and location characteristics.

4.3.1 Willingness to pay for water by gender and age of the household head

Women are generally known to be more willing to pay for water than men (Farolfi, et al, 2007; Vandemoortele, (2001). They are the primary users of water in the household charged with providing basic necessities that require water in the home. As such, they are keener on payment to avoid interruptions than the men (Kayaga, et al, 2003). Women disproportionately bear the burden of collecting water in the household. A relationship has been shown to exist between sex and willingness to pay f or water. This has been established for public stand posts, but not for private connections (Whittington et al (1990). Table 4.3.1 shows that there are great disparities in willingness to pay for water in South Africa in terms of gender of the household head.

The majority of the household heads both men and women are willing to pay for water. Male heads however show greater willingness to pay than their female counterparts. Of all the household heads interviewed, 67% of male and 57.1% female were willing to pay for water. The difference of 10% in favour of men in willingness to pay is so great. For those not willing to pay, 33% of them were male heads as oppose to 42.9% female heads. A test was statistically significant for this relationship indicating an association between gender and willingness to pay. The observed pattern is in contrast to the general view that women are more willing to pay for water than men. Men have not been known to be concerned with water issues, especially at household level (Wilsonet al, 2003). Report by Karuiki (2008) that more men (98%) than women (92%) claimed to pay for their water bills is in support of these findings. These results points to a shift in the traditional responsibilities of men and women in

the household. It could also be attributed to the policy of free basic water for all which makes people water to access water freely.

Table 4.3.1a Willingness to pay for water by age and gender of the household head

Gender	WTP for water	Age group			Total
		15-34	35-64	65+	
Male	Yes	2813	2550	519	5882
		66.7%	66.6%	67.3%	66.7%
	No	1402	1276	252	2930
		33.3%	33.4%	32.7%	33.3%
Total		4215	3826	771	8812
		100.0%	100.0%	100.0%	100.0%
Female	Yes	1608	1387	359	3354
		56.9%	58.4%	56.1%	57.4%
	No	1218	990	281	2489
		43.1%	41.6%	43.9%	42.6%
Total		2826	2377	640	5843
		100.0%	100.0%	100.0%	100.0%

Table4.3.1bTable of statistics for gender and willingness to pay

Gender				
Statistic	Chi-square	Lambda	Phi	Cramer`s V
Value	215.527[a]	.000	.102	.102
Asymp. Sig.	.000		.000	.000

4.3.2 Willingness to pay by population group and gender of the head

There are great inequalities in household water access correlating with racial groupings. Determination of willingness to pay by population group gives a clear picture of how household willingness to pay in this regard. It also provide information for us to be able to judge if the differences in access is strictly due to the political past or due to differences in willingness to pay. Like for access there are great disparities in household willingness to pay for water along racial lines. But for Blacks that fall below the national average, there is considerably high willingness to pay for water services for both male and female headed households. Table 4.3.2a shows that Black headed households are disproportionately less

willing to pay. While the differences between white, Indian and Coloured willingness to pay is minimal, Black differed greatly from these three groups.

White and Indian population groups have highest rates of willingness to pay. They score 96.6% and 97.3 and 97.5% and 97.4% for male and female headed households respectively. Their rates of non willingness to pay are negligible; less than 4% for both male and female headed household. That for Coloured was relatively high but not as high (above12%) for both male and heads. That is three times higher than White and Indian but comparatively lower than the Black with an amazing 44.3% and 48.8% non willingness to pay for male and female heads respectively. Considering gender of the household head, there seem to be no noticeable difference but for the Black with a significant difference of above 7% in favour of male household heads. A statistical test of significance to illicit the relationship confirm an association between these variables.

Table 4.3.2a Willingness to pay for water by Population and gender of the head

Gender	Willingness to pay	Population group of head of household				Total
Male		African/Black	Coloured	Indian/ Asian	White	
	Yes	4650	1617	375	1446	8088
		55.7%	87.3%	96.6%	97.5%	67.0%
	No	3702	235	13	37	3987
		44.3%	12.7%	3.4%	2.5%	33.0%
Total		8352	1852	388	1483	12075
		100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	3429	1012	110	451	5002
		48.8%	87.5%	97.3%	96.4%	57.1%
	No	3600	145	3	17	3765
		51.2%	12.5%	2.7%	3.6%	42.9%
Total		7029	1157	113	468	8767
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 3.2b Table of statistics for population group and willingness to pay

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	1607.978[a]	365	365	1003.069[b]	.338	.338
Asymp. Sig.	.000	.000	.000	.000	.000	.000

4.3.3 Willingness to pay for water by gender and province of residence of the head

Having established the differences in household willingness to pay for water in relation to gender and population group of the head, it is important recognise specific spatial influences which determine household willingness to pay. Household location location is a vital determinant if itôs willingness to pay (Farolfi et al, 2007; Mirajul et al, 2008). The 2007 GHS data makes no distinction between rural and urban. It however provides a spatial variable province of residence of the household head. There are major differences in household willingness to pay for water across the nine provinces with some having higher rates of willingness to pay than others.

Table 4.3.3b shows marked variations in household willingness to pay across the national territory. But for the Northern Cape, like for access, higher rates of willingness to pay coincide with highly urbanised provinces. Western Cape and Northern Cape have the highest rates of willingness to pay for both male and female headed households. Provinces least willing to pay for are Limpopo, Eastern Cape and Kwazulu Natal in that order. Except for the Western Cape, male heads are generally more willing to pay for water than female in all the provinces. Testing for this relationship, it was found to be statistically significant. This is consistent with earlier findings and implies that men throughout South Africa are equally concern with of water availability in the household. It however contradicts previous findings showing that households in areas where access is poor are more willing to pay. It is surprising that provinces with the lowest levels of willingness to pay are those where water access is problematic. Balfour et al (2006) note that the percentage of customers who pay their bills is one proxy for consumer satisfaction. This applies to household willingness to pay as well.

Table 4.3.3a Table of statistics for province of residence and willingness to pay

Gender	**Male**				**Female**			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	830.416[a]	032	.262	.262	998.070[b]	.055	.337	.337
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.000	.000

Table 4.3.3b Willingness to pay for water by province and gender of the household head

Gender	Willingness to pay	Province									Total
Male		WC	EC	NC	FS	KZN	NW	G	M	L	
	Yes	1534	802	691	775	1216	636	1540	566	352	8112
		84.6%	57.6%	79.4%	67.4%	61.1%	69.1%	72.6%	63.7%	36.9%	67.0%
	No	280	590	179	374	775	284	581	323	603	3989
		15.4%	42.4%	20.6%	32.6%	38.9%	30.9%	27.6%	36.3%	63.1%	33.0%
Total		1814	1392	870	1149	1991	920	2121	889	955	12101
		100%	100%	100%	100%	100%	100%	100%	100%	1005	100%
Female	Yes	831	613	459	558	841	463	645	320	282	5012
		86.7%	48.0%	77.4%	63.1%	51.0%	63.3%	64.3%	54.1%	25.7%	57.1%
	No	128	665	134	326	802	268	358	271	815	3767
		13.3%	52.0%	22.6%	36.9%	48.8%	36.7%	35.7%	45.9%	74.3%	42.9%
Total		959	1278	593	884	1643	731	1003	591	1097	8779
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

4.3.4 Willingness to pay and income and salary by gender of the head

In the introduction an association between household income and its willingness to pay for water services was hypothesised. To determine the available resources in a household, the salary of the household head was asked while income was used for those not working. Table 4.3.4a indicates that households headed by salaried workers are generally willing to pay for water services. The high rate of willingness to pay could be an indication of the need for better services. The GHS 2009 reported a decline in the level of satisfaction accounted for by deteriorating in quality of the services (Stats SA, 2009). Contrary to the hypothesis, male salaried household heads are more willing to pay for water services than the female heads for all salary categories. The difference in willingness to pay could be accounted for in terms the ability to effectively pay for water (effective demand). Men most often are involved tend more formal work than women who do unpaid work in the households. Most employed women do menial and low paid jobs.

Willingness to pay is directly related to salary for male household heads. This is not the case for female household heads. They have a somewhat inconsistent pattern. Household heads with low salaries (<1500) are the least willing to pay while those earning high salaries (16001+) are the most wiling as evident by the rates of willingness to pay . There however is a point where increase in salaries no longer leads to increase in willingness to pay. Chi-square test of association was significant for male but not female heads. As already stated, the lack

of association for female headed households is due to the fact that they most often do not do pay work.

Table 4.3.4a Willingness to pay by total Salary and gender of head of household

Gender	WTP	Total Salary					Total
Male		<1500	1501-4500	48501-8000	8001-16000	16001+	
	Yes	1492	387	142	99	5992	8112
		63.4%	63.2%	57.3%	69.7%	68.7%	67.0%
	No	862	225	106	43	2753	3989
		36.6%	36.8%	42.7%	30.3%	31.5%	33.0%
Total		2354	612	248	142	8745	12101
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	901	304	136	84	3587	5012
		58.25	54.8%	65.4%	58.7%	56.7%	57.1%
	No	648	251	72	59	2737	3767
		41.8%	45.2%	34.6%	41.3%	43.3%	42.9%
Total		1549	555	208	143	6324	8779
		100.0%	100.0%	100.0%	100.0%	100.0	100.0%

Table 4.3.4b Table of Statistics for willingness to pay and salary of household head

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	38.125[a]	.056	.056	8.301[b]	.031	.031
Asymp. Sig.	.000	.000	.000	.081	.081	.081

Unlike salary, the pattern observed for income suggests a decrease in rate of willingness to pay as income increases. Table 4.3.4 show that like salary, there are some inconsistencies observed for female heads that stated income. Household heads in the lower income bracket showed greater willingness to pay for household headed by male. The exceptionally high (60.8%) willingness to pay for female heads in the category 11001-16000 is difficult to explain. A test of association was statistically significant for the male but female household heads. The implication is that, while income influences male household heads willingness to pay, it is not the case with female household heads.

While willingness to pay for salaried heads is an expression the ability to pay for water, that for household heads who stated income is an expression of need for better services. Those with higher income probably have attained the desired level of service and have chosen to maintain their status quo. Most of the respondent in this category could be in business or retired people who have secured considerably better access over the years. They would

therefore not be willing to pay for what they already have. The lack of association between willingness to pay and salary on the one hand and income on the other for female headed households could be explained by the fact that women are the chief water users in the household. Their willingness to pay is an expression of household need for safe water rather than demand back by the capacity to pay (effective demand) as is the case of male headed households. These results suggest that although a basic level of water is provided free by constitution to all, low income households still do not have access to the resource. This supports the view that subsidies work to the advantage of the rich rather than the poor for whom they were intended to benefit.

Table 4.3.4c Willingness to pay for water by income and gender of the household head

Gender	Willingness to pay	Income categories				Total
Male		<4500	4501-11000	11001-16000	16001+	
	Yes	443	193	39	31	706
		70.2%	61.9%	50.6%	60.8%	65.9%
	No	188	119	38	20	365
		29.8%	38.1%	49.4%	39.2%	34.1%
Total		631	312	77	51	1071
		100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	224	149	38	15	426
		57.95	53.0%	60.3%	50.0%	56.0%
	No	163	132	25	15	335
		42.1%	47.0%	39.7%	50.0%	44.0%
Total		387	281	63	30	761
		100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.3.4d Table of statistic for willingness to pay and income of household head

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	30.687[a]	.025	.145	.084	16.415[b]	.011	.125	.173
Asymp. Sig.	.002	.033	.002	.002	.173	.228	.072	.173

4.3.5 Willingness to pay by employment status and gender of the head

Water is an economic good and like other economic goods effective demand for it is back by the ability to pay. Employment as a means of earning income is a very important determinant of household water connection and consequently its willingness to pay. There is a considerate willingness to pay for both male and female headed households. Table 4.3.5a shows that the

majority of the households headed by men and women of different employment status are willing to pay for water. Male headed households are more willingness to pay for water than female headed households. While male rates of are generally above 60%, those for female heads barely exceed 50%.

Table 4.3.5b further indicates that households headed by the non active are more willing to pay for water than those headed the employed and unemployed men and women. Non active male heads have the highest (70.6%) rate of willingness to pay. There is no significant difference between the employed and unemployed male heads. This is also the case for non active and employed female headed households with a difference of 1% in favour of the non active. The lowest rates of willingness to pay are observed for the unemployed as hypothesized; 63% for male and 51.85 for female household heads. Their status limits them from accessing water as they can afford the cost associated with it. The expressed willingness to pay is informed by this reality. It is surprisingly however that non active heads have the highest rates of willingness to pay. Because their status already means inability to pay, the observed willingness is interpreted as need for better services. This suggests that households headed by the non active could have relatively lower rates of access to safe sources as already established. The insignificant difference observed between willingness to pay rates for households headed by men and women of different employment status means that employment is not a determinant of household willingness to pay for water. This could probably be accounted for by the government policy free basic water (25l/p/d) for all South African Households. However, a test of association was statistically significant for this relationship.

Table 4.3.5 Table of Statistics for employment status and willingness to pay

Gender	**Male**			**Female**		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	68.446[a]	.075	.075	16.982[b]	.044	.044
Asymp. Sig.	.000	.000	.000	.000	.000	.000

Table 4.3.5b Willingness to pay for water by employment status and gender of the head

Gender	Willingness to pay	Employment status			Total
Male		Non active	Employed	Unemployed	
	Yes	4221	3079	812	8112
		70.6%	63.7%	63.0%	67.0%
	No	1757	1756	476	3989
		29.4%	36.3%	37.0%	33.0%
Total		5978	4835	1288	12101
		100.0%	100.0%	100.0%	100.0%
Female	Yes	2445	1920	647	5012
		58.3%	57.6%	51.8%	57.1%
	No	1751	1414	602	3767
		41.7%	42.4%	48.2%	42.9%
Total		4196	3334	1249	8779
		100.0%	100.0%	100.0%	100.0%

4.3.6 Willingness to pay for water and main dwelling Type of the head

There are marked differences in household willingness to pay according to their dwelling type. Except for traditional and informal dwelling types, there is a generally high rate of willingness to pay; over 61% for male and 72% female headed households for all dwelling types. But for flat/apartment/duplex, male headed households are more willing to pay for water than female headed households for all dwelling types. Households in poor quality dwellings are less willing to pay for water than those occupying dwellings of better. Table 4.3.6a indicates that households living in flats/apartment/duplex are the most willing to pay (over 80%) while those in traditional dwellings are the least with rates of 18.7%, and 12.7% for male and female headed household respectively. Informal dwelling also have very low rates of willingness to pay for both male (44.2%) and female (41.1%) headed households. A test of association to elicit this was statistically significant for all statistics computed indicating that household willingness to pay is related to its dwelling type.

Using housing quality and the corresponding rates of willingness to pay as a proxy to available resource in the household.These results could be interpreted to mean that households in traditional and informal dwelling are relatively poor. Their difficulty to pay for water is therefore expressed as non willingness to pay. This is a strong reason (25.2%) advanced for non willingness to pay for water. This is not the case for households in high quality dwellings who have relatively more resources and therefore more able to pay for

water as evident by their high rates of willingness to pay. The observed low willingness to pay could also be a miss interpretation of the policy of free basic water for all by a segment of the population. The miss conception that water is free accounts for their low rates of willingness to pay.

Table 4.3.6a Willingness to pay for water by main dwelling type and gender of head

Gender	WTP for water	Main dwelling type					Total
Male		Brick structure on separate stand/yard/farm	Traditional Dwelling	Flat/Apartment/ simplex/ duplex/triplex	Informal Dwelling	Room/flat let in backyard	
	Yes	4256	76	429	533	403	5697
		72.7%	18.7%	80.3%	44.2%	72.4%	66.6%
	No	1600	331	105	672	154	2862
		27.3%	81.3%	19.7%	55.8%	27.6%	33.4%
Total		5856	407	534	1205	557	8559
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	2491	56	273	253	224	3297
		61.6%	12.7%	84.0%	41.1%	64.4%	57.2%
	No	1551	386	52	352	124	2465
		38.4%	87.3%	16.0%	58.2%	35.6%	42.8%
Total		4042	442	325	605	348	5762
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.3.6bTable of Statistics for willingness to pay and of main dwelling type

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	841.632	.071	.314	.314	551.564	.103	.309	.309
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.000	.000

4.3.7 Willingness to pay for water and dwelling ownership of the head

One of the hypotheses formulated for this study was that willingness to pay is associated with dwelling ownership. Households living in owned houses have been shown to have a higher willingness to pay for water bills than those staying in rented premises (Kayaga, et al, 2003). In a similar study, Mycoo, (1999) found that home owners and landowners are more willing to pay than tenants and squatters. Since households that living in rented premises do not enter into legal obligation with water utilities, they have a lower rate of willingness to pay for water bills as they feel no obligation to the water utility (Kayaga, et al, 2003). Results are

in total agreement with the stated finding. Ownership is a strong determinant of household willingness to pay for water services.

Table 4.3.8a shows that a greater majority of households living in owned and fully paid and owned and not fully paid dwellings are willing to pay for water. The lowest rates of willingness to pay are exhibited by those in dwellings occupied free as part of contract or family and rented dwellings. The high rate of willingness to pay by households in dwellings occupied free not as part of contract or family implies that any feeling of ownership increases willingness to pay. There are disparities between male and female heads willingness to pay for the different ownership status. These differences are as high as high as 30% for owned and fully paid and rented and less than 7% for occupied free as boarder. The difference in favour of female headed households in rented dwellings points to the attention women place to water in the household.

A statistical test of the relationship was significant confirming an association between these variables. Casey, et al, (2006) observed that households not willing to pay are likely to have received their homes from a government program. This could be the case here as millions of households are living in RDP houses. These houses are constructed and given free to the poor and previously disadvantaged.

Table 4.3.8a Willingness to pay for water by dwelling ownership gender of the HH head

Gender	Willingness to pay	Dwelling ownership						Total
Male		Owned/ fully paid	Owned/ not fully paid	Rented	Occupied free/ part of contract or family	Occupied free/ not part of contract or family	occupied as a boarder	
	Yes	4458 97.5%	1074 82.3%	2134 49.2%	237 34.6%	154 73.0%	46 67.0%	8103 97.5%
	No	2946 2.5%	27 17.7%	458 50.8%	245 65.4%	291 27.0%	17 33.0%	3984 2.5%
Total		7404 100.0%	1101 100.0%	2592 100.0%	482 100.0%	445 100.0%	63 100.0%	12087 100.0%
Female	Yes	3409 51.7%	283 95.6%	1048 81.1%	116 41.0%	116 43.4%	37 77.1%	5009 57.1%
	No	3181 48.3%	13 4.4%	244 18.9%	167 59.0%	151 65.6%	11 22.9%	3767 42.9%
Total		6590 100.0%	296 100.0%	1292 100.0%	283 100.0%	267 100.0%	48 100.0%	8776 100.0%

Table 4.3.8b Table of statistics for dwelling ownership and willingness to pay

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	1176.779	.017	.312	.312	618.983	014	.266	.266
Asymp. Sig.	.000	.000	.000	.000	.000	.000	.000	.000

4.3.8 Willingness to pay for water by household size and gender of the head

A large family means more use of water, frequent water collection trips and more waiting time for those accessing public taps. Bigger households are more willing to pay for water than small households. Table 4.3.8b indicates that but for households of size 16-20, male headed households are more willing to pay for water than those headed by females. The rate of willingness to pay seems to increase with household size. While the biggest (16-20) households headed by women are most willing to pay (85.7%), their male counterparts are the least (50%). The reason for this is that, female headed households are likely to be bigger and poorer than male headed households (Dungumaro, 2007). Only 2 of the 9 16-20 are male headed. A test of association was no statistically significant confirm the observed pattern in Table 4.3.8a.

Reasons for relatively low rates of willingness to pay by the majority female headed households could include lack of financial means expressed as non willingness to pay. Existing empirical evidence suggest that, the bigger the size of a household, the poorer it is and the more difficult it becomes for it to access safe water. Economic status of female household heads is likely to be low as opposed to male household heads. While men in the most part work formally, they often do unpaid work in their households.

Table 4.3.8a Table of Statistics for willingness to pay and household size

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	8.056[a]	.026	.026	6.630[b]	.027	.027
Asymp. Sig.	.153	.153	.153	.250	.250	.250

Table 4.3.8b Willingness to pay household size and gender of the household head

Gender	Willingness to pay	Household size						Total
Male		Less than 3	4-5	6-8	9-11	12-15	16-20	
	Yes	5586	1655	717	127	26	1	8112
		66.8%	66.3%	69.7%	72.2%	76.5%	50.0%	67.0%
	No	2777	843	311	49	8	1	3989
		33.2%	33.7%	30.3%	27.8%	23.5%	50.0%	100.0%
Total		8363	2498	1028	176	34	2	12101
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	3253	1078	538	113	24	6	5012
		57.3%	57.9%	54.1%	57.4%	60.0	85.7	57.1%
	No	2426	784	456	84	16	1	3767
		42.7%	42.1%	45.9	42.6%	40.0%	14.3%	42.9%
Total		5679	1862	994	197	40	7	8779
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

4.3.9 Willingness to pay and highest level of education of the head

Education increases knowledge and awareness on the quality of drinking water and the dangers associated with the use of unsafe water sources. It is expected that households headed by highly educated men and women would be more willing to pay. Table 4.3.9a indicates that there are no great differences in willing to pay for water between householdôs heads of differing levels of education. The least educated male household heads however are the most willing to pay for water while female heads are. The least educated are the deprived of services in most societies and their high levels of willingness to pay could be an expression of need for safe sources. The highly educated due to the knowledge and high earning opportunities associated with it could have secured safe water for their households. They therefore are not willing to pay for what they already. The relationship was found to be statistically insignificant for both male and female headed households suggesting that level of education is not a predictor of water availability in the household.

In a country like South Africa where the government has adopted a policy of free basic water to every household, these results could be expected. The fact that water is free means that every household no matter the education of the head should have an almost equal access to safe drinking water as illustrated in Table 4.3.9b. Household willingness to pay is not strongly influenced by education. Education is therefore not an important determinant of household willingness to pay.

Table 4.3.9aWillingness to pay and highest level of education of the household head

Gender	Willingness to pay	Highest Education Level						Total
		No Schooling	Primary	Secondary	Dip/cert	Degree	Post Graduate	
Male	Yes	434	1473	3462	74	67	166	5676
		70.5%	65.6%	67.0%	67.9%	62.6%	64.6	66.8%
	No	182	773	1702	35	40	91	2823
		29.5%	34.4%	33.0%	32.1%	37.4%	35.4%	33.2%
Total		616	2246	5164	109	107	257	8499
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female	Yes	315	996	1780	35	31	114	3271
		58.7%	56.5%	57.1%	60.3%	60.6%	60.6	57.3%
	No	222	766	1335	23	20	74	2440
		41.3%	43.5%	42.9%	39.7%	39.2%	39.4%	42.7%
Total		315	996	1780	35	31	114	3271
		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.3.9b Table of Statistics for willingness to pay and highest level of education

Gender	Male			Female		
Statistic	Chi-square	Phi	Cramer`s V	Chi-square	Phi	Cramer`s V
Value	6.810[a]	.028	.028	2.195[b]	.020	.020
Asymp. Sig.	.235	.235	.235	.822	.822	.822

4.3.10 Willingness to pay and household water perception

According to Statistics South Africa, there has been a steady decline in the levels of satisfaction since 2005. This deterioration in levels of satisfaction is mirrored by an increase over time in the percentage of households who feel that their water is not safe. While there have been slight decreases in negative sentiments in the Northern Cape and North West since 2005, the percentage of households who are unhappy with their water quality increased significantly in Limpopo and KwaZulu-Natal for most of the indicators measured (Stats SA, 2009). Household water perception and satisfaction impact greatly on its willingness to pay for water services. The expectation is that high levels of satisfaction will result in greater willingness to pay. Table 4.3.10 shows that but for female headed households there are no differences in willingness to pay as a result of the quality of their water source. While there is no difference (0.5%) in willingness to pay for male heads who consider their water source as safe and unsafe, it is quite significant (3.2%) for female headed households. Male headed households are disproportionately more willingness to pay irrespective of their perception of water quality.

The equality in willingness to pay for male headed households perceiving water as safe and unsafe could be attributed to chance. Their answers to this question could have been arbitrary. Men generally are not the main users of water in the household and probably would not be knowledgeable about the quality of water. Women on their part are keen on water quality and their willingness could present a more realistic picture. However, a test of association between these variables was not significant for all statistics calculated. The insignificance indicates lack of association between willingness to pay and perception of water quality. It also implies that water quality does not influence peopleôs willingness to pay. It only becomes an important influence on household willingness to pay if connected to a reliable source has been secured. This surely is not the case for most of the household interviewed.

Table 4.3.10a Willingness to pay and household perception of their water quality

Gender	WTP for water	source of drinking water safe to drink		Total
Male		Safe sources	Unsafe sources	
	Yes	7873	231	8104
		67.0	67.5%	67.0%
	No	3875	111	3986
		33.0%	32.5%	33.0%
Total		11748	342	12090
		100.0%	100.0%	100.0%
Female	Yes	4873	134	5007
		57.5%	54.3%	57.1%
	No	3657	106	3763
		42.8%	45.7%	42.9%
Total		8523	247	8770
		100.0%	100.0%	100.0%

Table 4.3.10b Table of Statistics for willingness to pay and quality of drinking water

Gender	Male				Female			
Statistic	Chi-square	Lambda	Phi	Cramer`s V	Chi-square	Lambda	Phi	Cramer`s V
Value	.042[a]		.002	.002	.838[c]		.010	.010
Asymp. Sig.	.838		.838	.838	.360		.360	.360

4.3.11 Reasons for household non willingness to pay for water services

Arlene et al, (2007) investigating household willingness to pay for water identified various reasons for non willingness. These include, cannot afford, government should pay for water, poor services and quality of water. Table 4.3.11a illustrates that reasons advanced by South

African households for non willingness to pay are not very different from these. The most important of all the reasons advanced for non willingness to pay for water were absence of water meter (32.8%), inability to pay (25.2%), no billing system (23.1%) and water should be free for all (20.9%). The fact that others don`t pay and households using only the free basic water (25L/P/D) all scored 11.4%. Apart from the inability to pay for water, the absence of water meters and no billing system makes contribute greatly to household non willingness to pay. The feeling that water should be free is certainly a misconception the policy of free basic water for all which has been interpreted to mean no payment at all.

The fact that households limiting their water consumption to the minimal free basic water do not pay for water account for the why those who are not willing to pay as a result of the fact others are not paying. They consider it unfair and discriminatory and would resist by not paying as well. Irregular meter and irregular billing are not very important reasons for non willingness to pay accounting for only 3.2% and 3.3% respectively.

Table 4.3.11 Frequency of reasons for non willingness to pay for water services

Reason for non payment	Irregular meter	no meter	Billing irregular	no billing	meter broken	not able to pay	unhappy service	free for all	others don`t pay	uses FBW	others
Yes	245	2534	252	1779	119	1939	791	1607	881	875	1571
	3.2%	32.8%	3.3%	23.1%	1.5%	25.2%	10.3%	20.9%	11.4	11.4%	20.4%
No	7467	5185	7453	5934	7580	5770	6911	6099	6821	6831	6119
	96.8%	67.2%	96.7%	76.9%	98.5%	74.8%	89.7%	79.1%	88.6%	88.6%	79.9%
Total	7712	7719	7705	7713	7699	7709	7702	7706	7702	7706	7690
	100%	100%	100%	100%	100%	100%	100%	100%	100.0%	100%	100%

4.4 Multivariate analysis of water access and willingness to pay

This section presents results of multivariate analyses of access and willingness to pay for water in South Africa. These analyses allow assessing if some of the bivariate relationships that were identified in the previous section remain significant after controlling for other factors. It also identifies characteristics which appear to matter most for access and willingness to pay. Particular interested is in the relative role household variables play once we control for the other most obvious determinants of access and willingness to pay. These multivariate analyses are based on logistic regression.

The strategy consists of building two models with different set of variables in them; one for willingness to pay and the other water access. Model I involves the explanatory variable for the Willingness to pay is whether the household head was willing to pay for water at the time of the survey (1 Yes, 0 No). For water access, the variable main source is re-coded into a binary variable. Model II involves piped water and the other two (other improved sources and unimproved sources coded as one (1 Piped water, 0 others). In these models, all variables are treated as categorical. For each model, we do not only consider the significance of individual variables but also examine the significance of the model as a whole. Results are shown in the Appendix. The inclusion of covariates in the models is based on the literature reviewed earlier. Only those significant in the bivariate analysis are targeted for analysis.

4.4.1 Determinants of household access to piped water on premises

Model 1 (access to piped water) presented on page 105 show that of all the demographic variables only gender was associated with the availability of piped water on premise. The odds for age though not significant in the model showed that the likelihood of having piped water on premise reduces with increase in age. It is highest for the young adults (15-34). The cohort 35-64 was 27% less likely to have piped water on premise than the 15-34 cohorts while those aged 65 years and above was 11% less likely to have piped water on premise. The odds ratio for female is 1.401 meaning that households headed by women were 1.401 times significantly more likely than those headed by males to have piped water on premises. Like age, population group was not significant. Coloured and Indian were significantly less likely than blacks to have piped water on site. There is no effect for the whites.

The socioeconomic variables significant in the model are level of education, main dwelling type, and dwelling ownership. Primary, secondary and degree level of education were significantly less likely than those with no schooling to have piped water on premise. The

odds for the education variable showed no consistent trend. Post graduate degree was had no effect meaning that higher levels of education are not a significant predictor of piped water availability on the household. Availability on piped water on premise was shown to increase with income to a maximum at 8001-16000 income brackets. Any increase in income beyond this does not lead to an increase in the availability of piped water. While Technical and associated services and Domestic and elementary were 1.024 and 1.083 times more likely to have piped water on premises than Legislators, managers and associated professions, clerical, services and market and Agric, fishery and craft were less likely. The differences however were very insignificant.

Of the household variables included in the model, main dwelling type and ownership were found to significantly predict the availability of water in the household. There was no difference in the likelihood of having piped water on premise in terms of household size. All the dwelling types were less likely than Brick structure on separate stand/yard/farm to have pied water on residence. Flat/Apartment/simplex/duplex/triplex and Room/flatlet in backyard were the least with 78% and 67% respectively significantly less likely to have piped water on residence. Though significantly for predicting presence of piped water on premises, the odds for main dwelling type do not suggest that this increases with dwelling quality. This could be explained by the policy of free basic water. Like main dwelling type, dwelling ownership was a significant predictor of piped water on premises. Households in rented dwellings were highest (5.614) seconded by those in dwellings occupied free as part of contract or family (1.714). Apart for those in Owned and not fully paid that had the same access (.906), the rest were less likely than owned and fully paid dwellings to have piped water on premises. Living quarters on its part though not significant for predicting piped water on premises was consistent with the bivariate analysis. The odds however showed that workersô hostel was 1.936 times more likely than private dwelling.

All the provinces were more likely to have piped water on premises than the Western Cape which was used as the reference group. While most of them were 2 times more likely than the Western Cape, Gauteng Eastern Cape and Limpopo were 6.718, 4.155, and 3.624 respectively.

4.4.2 Determinant of household willingness to pay for water services

Column 2(Model 2 willingness to pay for water) of the appendix presents odd ratios from logistic regression model predicting the likelihood that household heads are willing to pay for water services. We can access whether differences in access is as a result of the targeted variables. Results show that, though not significant, household willingness to pay for water services tend to decreases with advancement in age. Young adults (15-34) were the most willing to pay for water services. The 36-64 age groups were 27% and 65+ 11% less likely to be willing to pay than the 15-34 age group. Female household heads were 1.401 times more willing to pay than the male heads. Indian and Coloured household heads were significantly less willing to pay for water than Black. Though displaying high odd ratios, there was no effect for White. While the effect of education was significant overall, only secondary and degree were significant. The other levels of all education had no effect on household willingness to pay. Willingness to pay however decreased with higher attainment of education. Post graduates were 21% less willing to pay than No schooling which had the highest level of willingness to pay. Income and occupation of the household head showed no significance. The occupation of the household head had no effect on its willingness to pay for water services. The odd ratios however showed that Tech and associated professions was 1.024 and domestic and elementary worker 1.083 times more willing to pay than those in the Legislators and managers, others had little or no differences.

While household size had no effect on willingness to pay for water services, it was significantly influenced by dwelling type and ownership. Households occupying Brick structure on separate stand/yard/farm were the loss willing to pay (reference). While the other dwelling types had no effect of willingness to pay, Flat/Apartment/simplex/duplex/triplex and Room/flatlet in backyard were significantly less 88% and 67% respectively less willing to pay. Dwelling ownership was significant found to be a significant predictor of household willingness to pay. There was no difference between households in willingness to pay for Owned and fully paid and Owned and not fully paid. Households in Rented dwellings were most willing to pay (5.614) followed by occupied free as part of contract or family with (1.714). Occupied as a boarder is the least willing to pay of all the ownership status 63% less than Owned and fully paid. When Living quarters are considered, Worker`s hostel are shown to be 1.936 times more willing to pay than private dwellings. But for Mpumalanga, all the provinces were significantly more willing to pay for water then the Western Cape. Gauteng was the most willing to pay (6.718) followed by the Eastern Cape (4.155), Limpopo (3.624).

Willingness to pay was seen to decrease with distance. The most willing to pay was Less than 200m (reference).

Table 4.4.1 Logistic regression for household piped water access and willingness to pay

Characteristics	Model 1 Access to piped water	Model 2 Willingness to pay
Demographic		
Age group	Non Significant .458	Non Significant .458
15-34	1.00	1.00
35-64	.734	.734
65+	.890	.890
Gender	Significant .036	Significant .036
Male	1.00	1.00
Female	1.401*	1.401*
Population group		Non Significant 000
Black/African	1.00	1.00
Coloured	.058*	.058*
Indian/Asian	.115*	.115*
White	33991612.115	33991612.115
Socio Economics		
Highest Education Level	Significant .019	Significant .019
No Schooling	1.00	1.00
Primary	.443*	.443
Secondary	.317*	.317*
Dip/cert with grade 12	.515	.515
Degree	.118*	.118*
Post graduate	.710	.710
Income	Not Significant .536	Not Significant .536
<1500	1.00	1.00
1505-4500	1.156	1.156
4501-8000	1.250	1.250
8001-16000	1.149	1.149
16001+	.836	.836
Main Occupation	Not Significant .823	Not Significant .823
Legislators, managers	1.00	1.00
Tech & associated	1.024	1.024
Clerical, serv, market	.994	.994
Agric, fishery, craft	.828	.828
Domestic & elementary	1.083	1.083
Household		
Household size	Not Significant .665	Not Significant .665
Less than 3	1.00	1.00
4-5	.000	.000
6-8	.000	.000
9+	.000	.000

Main dwelling type	Significant .000	Significant .000
Brick structure on separate stand/yard/farm	1.00	
Traditional Dwelling	.776	.776
Flat/Apartment/simplex/ duplex/triplex	.219*	.219*
Informal Dwelling	.807	.807
Room/flatlet in backyard	.327*	.327*
Dwelling ownership	Significant .000	Significant .000
Owned/ fully paid	1.00	1.00
Owned/ not fully paid	.906	.906
Rented	5.614	5.614
Occupied free/ part of contract or family	1.714	1.714
Occupied free/ not part of contract or family	.776	.776
occupied as a boarder	.373	.373
Living quarters	Not significant .447	Not significant .447
Private dwelling	1.00	1.00
Workersô hostel	1.936	1.936
Geographical location		
Province	Significant .000	Significant .000
Western Cape	1.00	1.00
Eastern Cape	4.155*	4.155*
Northern Cape	2.215*	2.215*
Free State	2.584*	2.584*
Kwazulu Natal	2.471*	2.471*
North West	2.232*	2.232*
Gauteng	6.718*	6.718*
Mpumalanga	1.565	1.565
Limpopo	3.624*	3.624*
Water		
Distance to main source	Significant .000	Significant .000
Less than 200m	1.00	1.00
201m - 500m	.139*	.139*
501m - 1km	.213	.213
More than 1km	.920	.920

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.1 Introduction

This study set out to examine household access to drinkable water of varying quality and how willing they are to pay for that water. Emphasis was on household demographic, socio economic, and location characteristics. In this chapter, findings from the analysis in the previous chapter are discussed in relation to the aim of the study with the purpose of demonstrating how the primary research question and the attendant secondary research questions were addressed and hypotheses tested through the application of the research design. The discussions are structured to clearly bring out the relationship between household water access and willingness to pay and how they vary according to the household variables under study. To properly address the research questions, discussions are structured along household socio demographic variables to provide answers to the research questions and the hypothesis set for the study.

5.2 Restating the problem and review of methodology

The problem statement for this study stated in chapter one highlighted the eminent lack of detailed research regarding the persistent inequalities in household water access particularly along gender and racial lines and among the provinces. Also noted was the lack of knowledge on how household access relates to its willingness to pay and the factors that account for these differentials. This study followed the design and methodology outlined in chapter three. The discussion of the research design is important in that it demonstrates the research procedure. It further emphasises the importance and significance of the research, the strength of the research design and methods used. It focused on household access and willingness to pay for household water services in South Africa. Furthermore, it looked at household perception of their water sources and services provided by the municipalities. The various causes of household water interruption and reasons for non willingness to pay were also examined. Individuals of concern were both male and female household heads of age 15 and above. Overall, the purpose of this study was to determine the main household water sources, the proportion of households accessing them and how this relates to household willingness to pay according to set household characteristics in South Africa.

This study was strictly quantitative in nature and made use of both descriptive and inferential statistics. It made use of secondary data from the 2007 GHS collected by Statistics South

Africa using survey methodology. Though weighted, this data is treated here as collected from a random sample. As a quantitative research, the relationship between predictor and outcome variables was determined. The independent variables were demographic, socioeconomic and spatial. The dependent variables on the other hand were access to water (main household source of water) and willingness to pay analysed separately. This research establishes associations between variables and that is how the data was analyzed in this study. The measurements of variables were defined in chapter three and the statistical methods were used to test the relationship between the variables. Predictive models were run using the binary logistic regression for both access and willingness to pay. To this end, household main water source was re-coded to a dichotomous variable. This meant combining other improved and unimproved and comparing with piped water on premises. The mean reasoning here is that piped water on premises is the ideal situation. It allowed for the prediction of the likelihood of living in a household with piped water and willingness to pay for water services. This type of research was necessary since it facilitated the purpose of this study that was to determine household access and willingness to pay for water in South Africa using the 2007 General household Survey.

The design utilised in this study was a cross-sectional design which is generally identified with survey research. The sample was randomly selected provincially amongst male and female household heads. The survey conducted by Statistic South Africa was carried out utilizing questionnaires to acquire data from the respondents with questions relating to their backgrounds, household water sources and service and attitudes towards payment of water. This study is limited in that it focuses on household heads who in the most part are men. The primary users of water in the household are women and menôs response would not give a proper image of household water services. Data were analyzed with the statistical program SPSS by means of descriptive and inferential statistics. Chi-square, Phi and Cramerôs V, Lambda were utilised to test for statistical relationships between the variables.

All the nine South African provinces were included in the analysis. The 2007 GHS makes no distinction between rural and urban and this therefore was not investigated in this study. The disparity in rural and urban household access to drinkable water on the one hand and willingness to pay on the other is well documented in the literature. The omission of this variable by statistics South Africa in the GHS data collection instrument means that the suggested inequalities are neither known nor can be accurately determine. It also hinders the

monitoring and evaluation of development efforts by government and other stake holders in bridging the rural urban divide; more so in the light of the MDG. Including this variable in the data collection instrument will go a long way to establish these differences and provide information on the progress made thus far and the formulation of appropriate policies.

5.3 Summary of the results and discussion

The aim of this study was to examine the differentials in household access to water and willingness to pay across the nine provinces of South Africa. This was investigated through variables such as age, gender, population, province of residence, employment status, occupation, income, type of living quarters, dwelling type, dwelling ownership, and distance main water source form the dwelling unit. The study first profile households according to the sources of water accessed. It was found that a greater majority of South African households access safe water. Of all the households investigated, 66.5% had piped water on premise, 25.4% other improved sources and 8.1% unimproved sources. While a greater proportion of male headed households had piped water on premises, females dominated for other improved and unimproved sources. This means that though most South African households have access to piped water, a considerable fraction of this is off site (dwelling unit or yard) and accessed mostly by female headed households. The pattern for willingness to pay is consistent with that for water access. Household with better access to drinkable sources are the most willing to pay. Male heads therefore are more willing to pay for water than their female counterparts. This difference is significant for Black headed households than other population groups.

5.3.1 Household access to water and willingness to pay

In this study, all household water sources were grouped into three categories according to the WHO/UNICEF Joint Monitoring Programme (JMP) methodology. This group water sources into the following three categories; piped water on premise, other improved sources and unimproved sources. Household willingness to pay according to household main water source as per the above methodology was established. Results of the analysis presented in chapter four suggest a generally high rate of willingness to pay for. A closer examination however revealed an association between household main source of water and its willingness to pay. The proportion of households willing to pay drop drastically as the quality of water becomes unsafe. Households accessing safe sources are most willing to pay as evident by the high rates of willingness to pay by households with piped water on premises. This answers the question; *"how does household water access relate to willingness to pay?"* Willingness to pay varies even among households with access to safe sources depending on the particular

source accessed. Those accessing on site are more willing to pay than those accessing public sources. The relations between household main source of water and willingness to pay was also found to be significant at $p<0.05$ confirming the hypothesis that *"household water access is associated with its willingness to pay."*

The generally high access to safe water sources speaks of the success of the policy of FBW that accounts for availability of water. It could also be due to the general decline in poverty identified as barrier to safe water access. The population living below the poverty line of $1 a day has been halved from 11.3% in 2000 to 5% in 2006 achieving goal one of the MDGs of halving poverty (Statistics South Africa, 2010). The municipalities charged with the task of water provision do not provide water directly into the dwelling unit. Connection into the dwelling unit is the responsibility of the household. The difference in household ability to pay connection charges accounts for the observed disparities in both source and quantity accessed. Households with relatively high access to piped water on premises have gone the extra mile to pay for their water either by way of connection charges or bills for consumption in excess of FBW as evident by their willingness to pay. The high access and corresponding willingness to pay is a reflection of the reported general decline in poverty.

5.3.2 Household water access and willingness to pay by household demographics

The established relationship between household demographic variables and access on the one hand and willingness to pay on the other provides answers to the research question set for this purpose. The question asked was, ñ*How does the age, sex and population group of the household head relate to its access and willingness to pay for water services?"* When tested, the relationship between age and household`s main water source was significant for males and not for females at $p<0.05$. Age of the household head therefore is not a determinant of the household water access for females. Men`s only concern about household water access in most cases is payment of bills. This happens in later in life. Unlike men, women of all ages are primary users of water in the household and are more concern about water availability. Access to water as well as willingness to pay is not a function of age for female household head. Access and willingness to pay for male household heads is an economic issue determined by the economic status.

Gender of the household head on the other hand significantly predicted household access and willingness to pay for water services at $p<0.05$. Contrary to the hypothesis *"male household*

heads are less willing to pay for water than female household heads", male headed households had better access and were more willing to pay. Statistics South Africa, (2010) reported the country`s attainment of its gender equality MDG targets. This however is not reflected in for household water access and willingness to pay. Though with some exceptions, male heads generally had better access to safe sources and were more willing to pay for water than female heads. This could be either as result of the different roles of men and women in the household or the existing poverty gap between male and female headed households. Women`s role in every household is crucial and any development efforts that neglect women is bound to fail. Though there is evidence of a decline in absolute poverty, the proportion of females living below $1 per day remains high compared to that of males. The relatively better access enjoyed by male headed households is as a result of their economic strength. Female headed households on their part are poorer and less able to pay and therefore rely on either other improve or unimproved sources.

The higher rate of willingness to pay observed for male headed households contradicts previous research findings. The literature documents a relatively higher willingness to pay for females. They are the primary users of water in the household and will be more willing to pay to pay to avoid any interruptions in household water supply. Household heads in the most part however are men and were the ones answering the questions during the 2007 GHS. This in itself was a mistake in that the questions were directed to the wrong person. Men most often are responsible for the payment bills in the household. Willingness to pay was probably wrongly interpreted to mean actual payment of water bills. The difference is due to the poor state of female headed households, a situation further compounded by their relatively large household sizes.

Regarding the population group, the study revealed glaring differences among the different groups in both access and willingness to pay. Majority of households headed by both men and women of all races have considerably high rates of access and willingness to pay. Black headed household however are not only lagging behind the other groups but are the least willing to pay for these services. These findings support the literature that Blacks have the lowest access to safe drinking water and disproportionately access unsafe water sources. The same pattern is observed across the provinces and even in predominantly Black dominated provinces like Limpopo, Eastern Cape and Kwazulu Natal. Poverty is a seemingly AN obvious reason for lack of access to safe water sources. Even with the reported general

poverty reduction, there remains high racial inequality in income distribution in South Africa. Black African population constituted 76.8% of households, earned 41.2 per cent of the R747.6 billion of income in 2006 compared to 45.3% earned by white who constituted only 9.2 per cent of the population (Statistics South Africa, 2010). Because Black headed households are poorer, they are the least served, accessing mostly other improved (public sources off-site) or unimproved sources. Poor access account for the low rates of willingness to pay observed. This suggests that household willingness to pay was an expression of service satisfaction. As already noted, the question asked in this regard was somewhat vague. It indicated neither the amount nor the level of service. As a result, respondents did a valuation of their current household water services.

5.3.3 Household main source of water and willingness to pay according to level of education of the household head

The level of education of the household like most socio economics variables, do not seem to have any influence on water access but impact willingness to pay greatly. Household access does not differ according to the level of education of the household head. Less educated males are more willing to pay than those with higher levels of education. The reverse is true for female headed households. The disparity however is minimal and is accounted for by the differences in economic status of educated males and females. While the difference in terms of level of level of education is minimal, it is very noticeable along gender lines. Like access, male household heads off different levels of education are more willing to pay than their female counterparts.

This answers the question*; "Does access to water and willingness to pay vary with levels of education?"* An educated population remains the fundamental platform for sustainable development. South Africa has attained the universal primary education (MDG 2) even before 2015 (Statistics South Africa, 2010). This is basic but enough to create awareness about the dangers associated with the use of unsafe water and account for the general high rates of access to safe sources. There is however a difference in terms of sources accessed by the households headed by men and women of differing levels of education. A greater proportion of households headed by those with higher education have piped water on premises. There seemed to be no considerable differences in willingness to pay according to the heads level of education. While household heads with lower levels of education are willing to pay to improve access, those with higher levels of education are willing to pay more to maintain present level of service. Anderson et al, (2010) contends that, households

with less clean water and more educated household members that perceive water pollution as a problem are willing to improve water quality.

Higher educational attainment in education does not only contribute to knowledge of the benefits of safe drinking water to individual health but opens up better earning opportunities. It has the potential to iron out income disparities. Literate and educated people are in a better position to obtain meaningful and decent formal employment itself a correlate of income. The educated can therefore afford to connection charges and water bills compared to the uneducated and are more likely to have piped water on premises. This explains why the highly educated have piped water on premises. It is more pronounced among female headed households due to the fact that while most uneducated women do unpaid work in the households, their educated counterparts work formally. This is not so for male headed household heads who tend to be gainfully employed independent of their levels of education.

5.3.4 Household main source of water and willingness to pay according to income and salary of the of household head

To answer the question, *"In what ways does household income influence its access to water and willingness to pay?"* the variables salaries and income were analysed separately. In the 2007 GHS, salaried household heads were asked to state their salary while none salaried heads stated income from sources other than salary. Results revealed that neither household access nor willingness to pay is influenced by salary and income. Male headed households had better access and corresponding higher rates of willingness to pay. It would however be mistaken to deduced that income and salary is neither a predictor of household access nor its willingness to pay as income is known to ease access to piped water. As already noted, the policy of FBW adopted by the government is tackling the inequalities in household water access due to income or salary differentials. Salary and income is a measure of absolute poverty and does not reveal the incidence of relative poverty. Households in areas with scant water sources with relatively high salaries and income would still not be able to access piped water. Income however accounts for the differences in sources and the quantity of water accessed as well as disparities in willingness to pay.

The 2010 MDG country report indicates severe racial disproportions in income distribution mainly skewed towards the Black African population. It further states that the proportion of females living below the poverty line remains high compared to that of males though the target in terms of MDGs has been achieved. This is reflected in access and willingness to pay

especially along gender and racial line where there are persistent inequalities. Female headed households as well as the Black are the poorest in the society deprived of safe water. While there is generally high access to safe sources overall as a result of the impact of FBW, disparities in sources and quantity of water accessed due to in household income differentials account for the observed pattern. While households with higher income access piped water on premises, those with relatively lower incomes access other improved and unimproved sources (off-site water sources). It is clear therefore that a better way of improving water access would be to alleviate poverty. Statistics South Africa, (2010) contend that poverty remains one of South Africaôs most serious development challenges despite the positive and improving impacts.

5.3.5 Household main source of water and willingness to pay according to the employment status and occupation of the of household head

Inequality in access and willingness to pay was also examined for households headed by men and women of differing occupations and employment status. The purpose of this analysis was to have a proper understanding of how access and willingness to pay vary with regards to occupation and employment status of the household head as correlates of income. The question asked was, *"How does the employment status and occupation of a household head affect its access to water and willingness to pay?"* There was found to be differences in both male and female headed households` access according to occupation of the head. Male household heads in the agricultural sector had the highest rates of access while legislators and managers were highest for female heads. Domestic and elementary professions had the lowest rates of access to water for households headed by both men and women. The pattern observed for willingness to pay was more or less the same as that for access.

Agriculture in South Africa for many years has been in the hands of wealthy White Afrikaners. Polarization of services including water during the apartheid era greatly favoured this group. It could also be a reflection of their relative economic power due to past privileges. This is an advantage they are willing to maintain as evident by their levels of willingness to pay. Households headed by men and women in domestic and elementary professions on their part suffer deprivation in most societies. It is no surprise that they are accessing unsafe sources. Women`s non involvement in agriculture which is mostly on an industrial scale and dominated by white males explains why legislators and mangers were highest for accessing safe water for female headed households. This group of professionals was also the most willing to pay among female headed households indicating a satisfaction

with the present level of household water service and quality. Overall, household heads in occupations with greater earning opportunities have better access and are also more willing to pay.

The pattern for employment status of the household head was more or less the same like that observed foe occupation. There however were noticeable differences in favour of the non active and unemployed household heads in that order suggesting that water provision programmes targets mostly the poor. Unlike access, there is no difference in willingness to pay between the employed and unemployed. Surprisingly, non active male heads are most willing to pay. This suggests they are getting relatively poor services either unimproved or other improved sources in areas where public sources were available. The same reason applies to unemployed female heads that equally were the most willing. The 2009 GHS reported 88.9% male as against 93.0% female employed. It further indicates that female household heads are engage in very low paying jobs. In all cases, male headed households had better access and were more willing to pay. Because of the generally low salaries, there is little or no difference according to the employment status of the household head. About 5.2% of the employed are reported to earn less than $1 per day (Statistics South Africa, 2010). Some of these unemployed heads are retirees who had secured access to safe water sources during their working life and still have income in the form pension to pay for water bills.

5.3.6 Household main source of water and willingness to pay according to province of residence of the household head

Findings presented in chapter four show great spatial disparities in household access and willingness to pay for water. The 2007 GHS data makes no distinction between urban and rural. It was therefore impossible to determine disparities in access and willingness to pay between urban and rural areas suggested in the literature. The variable province however allowed for the examination of the variation in household access and willingness to pay across the national territory. As highlighted earlier, Limpopo, Eastern Cape, and Kwazulu Natal had comparatively poor access to water and a corresponding willingness to pay. High access and willingness to pay is observed in the largely urbanised provinces of the Western Cape and Gauteng. While the difference between male and female headed households in these provinces is minimal, it is significantly high for those with lower rates. In some of these provinces, almost half of the female headed households neither have access to safe water nor are willing to pay. This is explained by the difference roles rural and urban women play in

the household considering that Limpopo, Eastern Cape and Kwazulu Natal constitute some of South Africa`s rural provinces.

This provides an answer to the research question; *"Are there differences in access to water and willingness among the provinces in South Africa?"* Though there was no clear distinction between what is considered rural and urban, it is common knowledge that the Western Cape and Gauteng are South Africaôs most urbanised provinces while the Eastern Cape, Kwazulu Natal Limpopo are among the least urbanised. Katharine Hall, (2009) reporting on urban-rural distribution of housing services identified Western Cape and Gauteng as entirely urban and Limpopo as rural. It further states that the Eastern Cape and KwaZulu-Natal though home to some of the largest cities in the country, have large rural populations. On this premise, it is clear that households in the urban have areas relatively better access to safe water sources. The relative advantage enjoyed by households in the urban area is as a result greater availability compared to the rural areas accessing traditional sources (streams, ponds, wells).

The rural areas do not compete well for investment in the water sector due to the comparatively low rates of willingness to pay mentioned above. The literature also points to the fact that governments pay greater attention to the urban areas. Northern Cape, one of south Africa`s rural provinces surprisingly had considerably high access to water and willingness to pay. This could be attributed to its high proportions of coloured population as against others dominated by Blacks. Unlike Blacks who resisted payment of services as punishment to the apartheid and that has become a way culture, coloured were relatively favoured and are therefore willing to pay. Statistics South Africa, (2010) reports that, Black households accessing unimproved (unsafe) water sources were mostly not willing to pay and constituted 96% of rural households. These are the rural poor not accessing poor with scant safe water sources. This is an indication of the neglect of the rural areas in governmentôs development efforts.

5.3.7 Household main source of water and willingness to pay according to the living quarters dwelling type and tenure of the household head

This study also investigated the variation of household water access and willingness to pay according to selected household variables. Interestingly, there were marked inequalities according to living quarters, dwelling type and tenure status (dwelling ownership). Households occupying worker`s hostels have better access and are more willing to pay for

water than those in private dwellings. While there were marked differences in both access and willingness to pay between male and female headed households occupying private dwellings, those in workersô hostel have equal access to water but differ slightly in willingness to pay. The pattern observed here is as a result of the fact that, unlike private dwellings, workers hostels are not responsible for the availability of water in the household. They only take up payment of bills once they have occupied these dwellings if household water consumption exceeds FBW. The difference in willingness to pay is not a result of differences in access as is the case for private dwellings. While households in worker`s hostel are willing to pay to maintain the services they are having, those in private dwellings are less willing to pay due to the relatively poor access.

While there was found to be no difference between males and female headed households in worker`s hostel., those in private dwellings differed significantly. The fact that the institution and not household heads provides water in worker`s hostels accounts for the gender equality in access. This however is not the case with private dwellings where household connection to water network befalls the head. Observed differences in terms of sources and quantity is a reflection of the ability to pay connection charges and water bills measured by household income. Households living in private dwellings have piped water on premises while the others rely on other improves sources (public taps) or unimproved sources. Household with better access are more willing to pay to maintain their status quo.

Furthermore, the literature suggested the existence of a relationship between household dwelling type and water access on the one hand and willingness to pay on the other. Investigating for this relationship it was found to be a significant predictor of household water access and willingness to pay at $p<0.05$. Household water access and willingness to pay is strongly related to the dwelling type occupied by the households and increases with the quality of dwelling unit. Most quality dwellings have piped water on premises. It is obvious therefore that household occupying such dwellings would access safe water. Like workers hostels, better quality houses are built with all the facilities including water. Households occupying them have piped water in the house (piped water on premises). Traditional dwellings are a rural feature where accessing traditional water sources like streams, ponds and springs are a common practice. Where piped water does exist, they are most often public taps at a walking distance or further away from the dwelling unit. The same applies to informal dwellings and explains why these two dwelling types were the least willing to pay.

The pattern observed for Willingness to pay is also related to the quality of water and service provided to the household, itself is linked to the dwelling type. While households in standard quality dwellings are willing to pay to maintain their status quo, those in traditional and informal housing see no reason to pay pay for a service they do not have. The response provided is in relation to the current household water services. When controlled for gender, the relative advantage of the male headed households to access safe sources resurfaces. The implication is that female headed households occupy poor quality dwellings. The percentage of informal dwellings resumed an upward trend to 15% in 2007. Statistics South Africa, (2010) attributes this to increasing number of households that has led to an increasing demand for private household and family space. Because these dwelling types generally lack basic services, this increase could mean increase in the proportion of household accessing unimproved water sources.

Regarding tenure status or dwelling ownership, results obtained showed that any form of ownership was likely to increase both access and willingness to pay. It was found to significantly affect water access and willingness to pay at $p<0.05$. Surprisingly however, full ownership had the lowest access to safe drinking water. The reason here is that most quality dwellings with water services are bought on hire purchase. Fully owned dwellings are therefore low quality (traditional and informal) dwellings constructed by the households. Water connection could be postponed to a later date due to financial constrains; more so where drinkable public water sources are in close proximity of the dwelling unit. Using the National Income Dynamic Survey (NIDS) data, Hoyer (2010) found that 69.03% of households own their current dwelling. The highest rate of homeownership is in tribal authorities, followed by urban informal areas. Households in these areas are known to access other improved or unimproved sources. It is no surprise therefore that they had very low access.

Households occupying dwellings free as part of family were more willing to pay than those in who occupied it as part of contract or rented. Membership of the family that owns the dwelling gives a sense of ownership and consequently affects willingness to pay positively as oppose to contract and rented with no sense of ownership. Households in owned and not fully paid off dwellings had the highest access rates. This could be explained by the fact that most quality dwellings that normally connected to piped water in premises in South Africa are not

self constructed. As already highlighted above, these are constructed with provision for all basic services including water and sold mostly on hire purchase. Households with this ownership status would therefore have better access to piped water on premise in sufficient quantities as they mostly occupied by the upper segment of the society.

This analysis is limited in that ownership is here is considered as absolute and therefore should be interpreted with caution. There is no distinction in terms of the type of dwelling owned. It compares ownership of dwellings of different types. Findings by Hoyer (2010) that most owned and fully paid dwellings are in the tribal areas support the results on tradition dwelling types which is a predominant feature of the tribal areas (rural areas). There seeming are therefore serious inequalities between rural and urban areas in both access and willingness to pay. This could not be properly investigated in this study due to the absence of this distinction 2007 GHS data advanced as a limitation in the chapter one. There needs to be more concerted effort both by the government and other stake holders geared towards sustainable development and poverty alleviation in the rural areas to improve the plight of the rural masses.

5.3.8 Household main source of water and willingness to pay according to household size of the household head.

Household size was analysed to explore the extent to which it affect household water access and willingness to pay. There was found to be considerably high access to pied water for households of all sizes. Results showed an association with household willingness to pay for at $p<0.05$. Bigger households had relatively poor access as they were connected more to other improved sources and had the highest proportion of households accessing unimproved sources. They were comparatively and were more willing to pay for water services. The high willingness to pay is an indication of need implying that bigger household are less able to afford water connection charges as bigger sizes mean greater competition for the available household resources. Forced to choose due to limited resources, heads of bigger households would therefore prefer buy food and collect water from a well, a neighbour or public tap or other unimproved sources.

The observed gap in both access and willingness to pay between male and female headed households is consistent with the literature. It is well documented that female headed households are relatively bigger. Seven of the nine households of size 16-20 were female headed. Their bigger sizes mean many mouths to be fed rendering them are relatively poor as

well. This means even more struggles and choices to make in meeting household needs. The obvious choice as already noted is not always to secure safe water but food. This explains why they had low access rates to piped water on premises but scored higher for other improved and unimproved sources. The fact that they cannot access safe water accounts for the comparatively willingness to pay; this not because they do not want to but because they cannot afford to do so. Population policies favouring and government intervention that take into account household sizes will go a long way to reduce poverty and consequently improved access not only to piped water but other basic services.

5.3.9 Household main source of water and willingness to pay according to perception of water source as safe by the household head.

An examination of household water perception was done in an attempt to determine how household perceive their water sources. The objective here was to ascertain the quality of water accessed by the different households. If not constrain, people normally would access the safest possible drinkable water sources. There was found to be a significant relationship between household perception and its willingness to pay for water at $p<0.05$. The majority of the households perceived their water sources as safe. This is an indication that the quality of water supplied to South African Households is generally of good quality. Households perceiving their water sources as safe were also more willing to pay. Households which considered their drinking sources as unsafe are probably accessing unimproved sources due to inability to pay evident by their non willingness to pay. This could be as a result of the absence or lack of means to do access drinkable sources.

Household perception differed significantly along gender and racial lines and across the provinces. Female headed households compared to male headed households perceived their water sources as unsafe. The temptation would be to conclude that female headed households have relatively access to safe water sources. Alternatively, the differences could be explained in terms the knowledge of household water quality. Women are the primary users of water in the household are therefore more knowledgeable about household water quality. Their perceptions could therefore be a more realistic view of the quality of water. Black households had relatively low perception rates for household water source as safe and were also less willing to pay because they access mostly unsafe water. This is simply because they disproportionately access unsafe water.

The perception observed at the national along gender and racial lines in the replicate in the provinces. There however were no major differences in male and female headed household perception of their water sources within the provinces. Eastern Cape, Kwazulu Natal and Limpopo which had very relatively poor access to water and willingness to pay were also the provinces with lowest perception rates of household water as safe. These provinces are also home to a considerable proportion of south Africa`s rural population. Access to traditional sources mostly unsafe due to a near absence of piped water is common and account for the observed differences. Water provision should be given priority in rural development initiatives and policies.

5.3.10 Household main source of water and willingness to pay according to distance to water source

The distance covered by household members to collect water is a critical component of water access. Any definition of water access which does not include distance is incomplete. In South Africa, a household is considered to have access to water if its source of water is within 200m of the household. There was found to be a great variation in the distances travelled for water collection among households headed by men and women of different population groups across the national territory. Generally, male household head access water at relatively shorter distances from the dwelling unit. The average distance travelled by male headed households was found to be 0.208 Km (208m) as against 0.210 Km (210m) for females. Judging from the mean distance to household main water source it would be misleading to conclude that South Africa has attained the goal of access water within 200m of the dwelling unit. These are averages and do not give the actual distances covered by household members. Distance is not the only criteria for access and some of the sources accessed are also of questionable quality.

The pattern observed for willingness to pay was in accord with the distance travelled for this purpose. Household accessing water further away from their dwelling unit were less willing to pay than those that had piped water on premises. Willingness to pay decreased away from the dwelling. The relatively non willingness to pay exhibited by households covering long distances proves their unhappiness and helplessness about the situation. Black headed households were highest for accessing distant water sources and least willing to pay compared to other population groups. They are the most dissatisfied most as evident by their non willingness to pay probably because they have the highest access rate to these distant sources. Mean distance travelled for water collection purpose computed showed that Black

travelled 0.233Km (233m), Coloured 0.119Km (119m), Indian 0.38Km (380m), and White 0.183Km (183m) respectively.

This scenario replicates across the entire national territory. Household in Eastern Cape, Kwazulu Natal and Limpopo had very high proportions of household accessing sources as far off as 1km away from the housing unit. It is not surprising however as they host a considerably high proportion of Black and rural population. The fact that Blacks remain the disadvantaged even in the predominantly Black communities points to a polarized society where race is a predetermining factor of household water access. Though the data makes no distinction between rural and urban, results point to the fact that, provinces with high rates of access and willingness to pay are the most urbanised. Eminent here is the inequality in service provision between rural and urban areas. The high access rates in some of the big cities in the Eastern Cape and Kwazulu Natal is cancelled out by the poor state of the rural households.

5.3.11 Household municipal water, service rating and willingness to pay by gender, population group and province of residence of the head

It is the responsibility of local municipalities to deliver basic services including FBW to the communities. The analysis of this variable allows for the determination of household connection to municipal water network. It also helped to determine household satisfaction with municipal water services and performance in this regard. Access rating and willingness to pay for municipal water was found to vary with gender population group and province of residence of the household head. Overall, those who had better access to this source rated it as good and were more willing to pay. Black headed households again had the lowest access to municipal water services and were the least willing to pay. As already established, households with poor access to municipal sources are not willing to pay. This is evident by their low rates of willingness to pay. Female headed households had better access to these sources than their male counterpart. The implication is that municipalities cater for the deprived and disadvantaged in the society as they are charged with the implementation of the policy of FBW. Women shown to have difficulty in accessing water find access to this source relatively easy. The facts that these are public sources off-site explain why female household members cover relative longer distances for water collection.

When controlled for province of residence, there was found to be no significant difference in household access to municipal water. Only Kwaazulu Natal was found to differ significantly

from others. While access was generally above 70% in most of the provinces, Kwazulu Natal fell below 60%. Again controlling for gender, female headed households were found to dominate for the majority of the provinces. This confirms as already stated that households headed by females have better access to municipal sources and points to the municipal services are access by the poor less privilege in the society. It also point to the relative ease at which municipal water is accessed. There was however male dominance for this sources in provinces like Kwazulu Natal, Mpumalanga and the Eastern Cape with predominantly Black population. It could either be that municipal water is the only safe sources of water in these communities or that male heads have an advantage over females. In all the cases, households that had the high access to municipal water were also willing to pay.

When asked to rate municipal water services, a greater majority of the households rated it as good. The observed ratings indicate that most household headed by both sexes, of all the population groups and in all the provinces were satisfied with the services provided by the municipalities. Households that rated the service as good were equally willing to pay. Among the different population groups and across the national territory, Indians were most willing to pay while blacks were the least willing to pay. Gauteng with the highest rating of municipal water as good was ranked first for access to this source and also very willing to pay. The province with the lowest rate was Limpopo. Eastern Cape and Kwazulu Natal also had very low ratings for municipal water services. Considering these ratings as a gauge for municipal performance in water service delivery and household satisfaction, it could be concluded that the quality of service differ considerably across the national territory. While some provinces and municipalities are doing fairly well, others perform poorly. Though there is a general willingness to pay, only house household with considerable access are willing to pay.

5.3.12 Reasons for non willingness to pay for and Causes of interruption

Like every economic good, access to water is generally secured by way of payment for the services. Even countries like South Africa where the government provides FBW, consumption in excess is paid. It is however well documented that in South Africa, there is a considerable high level of non willingness to pay for water. This is problematic as government and other private water providers as payment is crucial to sustainability and expansion of the service to other users. Reasons for non willingness to pay presented in chapter four are many and varied. Prominent among them is the absence of water meters (32.8%) in ability to pay (25.2%), absence of a billing system. As reported by ....., vandalism of water meters though not to the same magnitude was reported to be one of the

reasons for household water interruption. The high levels of vandalism and poor community attitudes to these services is as a result of the fact that ñthe former homeland governments provided very limited services on a free basis with the proviso that there should be no democratic provision in managing servicesò (HSRC, 2004). What is evident is the discontentment of the population with the services provided. It also brings to the fore inefficiency of the service providers in meeting the needs and expectations of their customers.

The fact that a considerable proportion of the households were not willing to pay because they think water should be free all (20.9%) explains the vandalism of water metals. A small proportion of households (11.4%) reported they were using FBW. This is an indication that a greater majority of South African household water use is exceeds the basic provided by government. Households therefore would have to incur cost in terms pr payment of either connection charges or water bills to meet household water needs. A significant proportion (25.2%) reported not afford to pay for water. poverty therefore is a major barrier to water access. Rather than subsidise FBW that does not meet household needs, government should formulate policies geared more towards poverty alleviation and economic empowerment to permit household provide their basic needs.

Evident from the reasons advanced for non payment of water is the miss understanding of the government policy of FBW. 11.4% of the households thought it was unfair to pay for water when others were not paying attest to this. Their interpretation is that water is free to all irrespective of the consumption. Households considered not to be paying for water here are probably those who have restricted their consumption to the FBW. As a result, the population think it is unfair and discriminatory to pay for water. Non payment of services (cut-off) and pump not working advanced as causes of household water interruption point to the fact that households generally do not pay for water. This was a strategy adopted frustrate the Apartheid regime and over the years has become a culture and carries on in the new South Africa. Because the sustainability of this service depends so much on payment, there needs to be a rethinking of policy of service provision on sustainable basis.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

6.1 Some concluding remarks

This chapter presents conclusions arising from the discussions of the findings in chapter five relating to the research questions and hypothesis outlined in the introductory chapter. This is followed by recommendations, which are grounded in the findings of the study, and aspects for future research are highlighted.

This study focused on the assessment of household water access and examination of the determinants of water access and willingness to pay. The research also aimed at determining the likelihood of accessing safe water sources according to certain household socio demographic characteristics. It made use of secondary data (2007 GHS) using bivariate and multivariate methods of analysis to achieve this end.

Based on the findings, there are great disparities in household access and willingness to pay in South Africa. Despite the progress made in delivering water infrastructure post-1994, inequalities have persisted among households. The ability of the policy of FBW initiated by the national Government in 2001, sought to provide all citizens, but particularly the poor, with a basic supply of free water meant to improve public health, gender equity, affordability, and to serve as an instrument of post-apartheid redress and poverty alleviation to target the poor is questionable. It is the poor who continue to suffer from lack. As suggested by Christmas and de Rooy (1990), water subsidies seem to serve the minority rich rather than the poor for which it was intended. It no doubt has helped improve universal access and eliminated the effect of income differential on household water access. Income however remains a key determinant of household main source of water. While higher income households have piped water on premises, poor households either access other improved sources (public taps) or unimproved sources in areas where they are absent.

Not only are there great disparities and inequalities in household water access in South Africa, but they seem to follow the same pattern observed during the apartheid era. As highlighted above, most if not all the initiatives taken post 1994 were meant to correct the injustices of the past. Those who suffered exclusion from all spheres of public life predominantly Blacks in the then homelands are most in need throughout the national territory but particular in the rural provinces of Limpopo, Eastern Cape and Kwazulu Natal. They are the most accessing unimproved (unsafe) water sources and access to safe sources of

drinking water is mostly through public sources sometimes involving long distances. This is more pronounced in the rural areas of Limpopo, Eastern Cape, and Kwazulu Natal with scant safe water sources as highlighted above. The obviously labour intensive access to water in these areas leaves much to be desired.

In the light of these findings, the report by Water Institute of South Africa that the MDG goals for access to water have already been attained raises eyebrows. Also, the eminent disproportionate advantage men have over women not only contradicts but questions the 2010 MDG report by Statistics South Africa of the successful attainment of gender equity. Though this study used 2007 GHS data, three years is too short a time to achieve so much in a country like South Africa where service delivery for so long has been problematic. The assessment of MDG regarding water access makes use of the WHO/UNICEF Joint Monitoring programme (JMP) methodology which was used in this study. Apparently, Statistics South Africa does not use this methodology and their results in this report could only be probable.

In South Africa like the world over, access to water shows that potable water is scarce. Meanwhile, anything scarce and in high demand commands a price. Willingness to pay for facilities is therefore a major element in determining the success and sustainability of water supply (Cairncross, 1992). This economic concept of willingness to pay is supported by major development agencies such as the World Bank promoting the pricing of water as a means for public water utilities to manage the allocation of existing water supplies more effectively. This study revealed a high degree of non willingness to pay among South African households. This raises serious problems given the centrality of payment to the future of water supply. Household water access was found to be intrinsically tied to its willingness to pay. Households accessing safe drinking sources at close proximity to the household (piped water on premises) were the most willing to pay. It also explains the disparities between provinces which are in line with the literature that the urban poor are willing to pay as a result of their demand for access to potable water.

The differences in both access and willingness to pay between province suggests either government`s neglect of the rural masses and the poor in the informal settlement or the lack of capacity in terms of resources and or man power to deliver in these communities. Though there has been strong emphasis on rural development in recent years, practice suggests the

contrary. Seemingly, there is a prioritisation of the urban areas in government intervention programs. Household conditions in the rural areas and informal settlements are appalling compared to those in the metropolitan towns and cities. Success of the various poverty alleviation schemes will go a long way to improve household water access especially in the rural areas that do not compete favourably for investment in this sector.

The sufficiency of FBW which has been a subject of debate was highlighted by this study. Exactly how much was enough, and what was the rationale of choosing 25 litres per person per day? Despite the FBW, payment remains a key determinant of household access to adequate and sufficient water in South Africa. As stated in the third paragraph, income does not limit access to water as but determines the source and the quantity of water accessed. The FBW is largely insufficient and many households water consumption is far below their actual water needs due to lack means to secure sufficient quantities. This is a potential health hazard and presents a real challenge as the declaration of FBW already meant a new imperative for local government. Fiscal resources needed to keep up with the supply of FBW are in scarce supply and it opting to increase quantity to meet household water needs would be unwise and unsustainable. Going for full payment in a country where poverty is rife and with a culture of non willingness to pay is disastrous. Any policy that takes into consideration household size would definitely improve household water access.

6.2 Recommendations

Given that access to safe water sources in the predominantly rural provinces is problematic, it is recommended that the capacity of the local government in the Eastern Cape, Kwazulu Natal and Limpopo be strengthened through either the adoption of new strategies, training, seconding expertise from best performing to poorly performing municipalities to deliver water services to the communities. The national and provincial governments must support the local government in this regard as they are ill equipped to handle the challenges they face. Attention to these provinces should be government priority. I recommend that further research be carried to elicit factors contributing to the observed spatial disparities in access and willingness to pay for water especially rural urban.

Government should focus on the improvement of water supply as a means to reduce poverty. Water related policies should priories Blacks and but most especially female headed households who continue to disproportionately access unsafe water and travel longer distances for this purpose. I recommend therefore that policies be formulated that pay greater

attention to the previously disadvantaged and particularly women who are the primary users of water in the household. They should be given an advantage over groups that were privilege under the previous regime in order to bridge the existing gap.

The unwillingness to pay for water services among within black communities is problematic considering that payment is key to sustainable provision of domestic water depends. It suggests either a misconception of the policy of FBW or the persistence of the general denial to pay which was a common practice in the past as a means of revolt against the repressive apartheid regime. A massive conscientisation and sensitisation campaign should be carried out to educate the citizens on the need to pay for water services and deceased from habit of free services which has almost become a culture. Exit strategies from the complete reliance on subsidies needs to be explored for provision of sustainable services.

This study could not measure the inequalities between rural and urban household due to lack of a proper distinction in the data set. Further Studies therefore should be conducted at the national level to determine the actual situation in terms of disparities between the rural and urban households. Distance is as a critical component of water access measured in meters or kilometres is not easily visualised. The labour in terms of distance to water source travelled especially by women in the rural areas is not fully appreciated. For better understanding and appreciation, I recommend that research be conducted in which distance is measured in terms of the time taken to collect water.

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Appendices

Appendix 1 main source of water by Population group and province of residence

Population group	HH main source of water	Province									Total
		WC	EC	NC	FS	KZN	NW	G	M	L	
Black	piped water on premises	641	1227	611	1735	2693	1225	2488	1461	1143	13224
		79.4%	39.0%	92.9%	88.2%	43.0%	54.8%	86.9%	73.5%	41.8%	58.4%
	other improved sources	165	1117	44	222	2357	1000	373	444	1388	7110
		20.4%	35.5%	6.7%	11.3%	37.7%	44.7%	13.0%	22.3%	50.7%	31.4%
	unimproved sources	1	804	3	10	1209	11	1	82	205	2326
		.1%	25.5%	.5%	.5%	19.3%	.5%	.0%	4.1%	7.5%	10.3%
	Total	807	3148	658	1967	6259	2236	2862	1987	2736	22660
		100%	100%	100%	100 %	100%	100%	100%	100%	100%	100%
Coloured	piped water on premises	1815	339	895	118	78	44	66	7	5	3367
		97.3%	90.9%	90.7%	87.4%	88.6%	89.8%	98.5%	77.8%	83.3%	94.1%
	other improved sources	45	31	65	17	10	5	1	1	1	176
		2.4%	8.3%	6.6%	12.6%	11.4%	10.2%	1.5%	11.1%	16.7%	4.9%
	unimproved sources	6	3	27	0	0	0	0	1	0	37
		.3%	.8%	2.7%	.0%	.0%	.0%	.0%	11.1%	.0%	1.0%
	Total	1866	373	987	135	88	49	67	9	6	3580
		100%	100%	100%	100%	100%	100%	100%	100.%	100.0%	100.0%
Indian	piped water on premises	6	8	7	4	387	13	69	13	11	518
		100%	100%	100%	100%	98.7%	92.9%	100%	100.%	78.6%	98.3%
	other improved sources	0	0	0	0	5	1	0	0	3	9
		.0%	.0%	.0%	.0%	1.3%	7.1%	.0%	.0%	21.4%	1.7%
	Total	6	8	7	4	392	14	69	13	14	527
		100%	100%	100%	100%	100%	100%	100%	100%	100.0%	100.0%
White	piped water on premises	560	273	170	202	295	122	355	112	65	2154
		98.6%	94.8%	92.9%	98.1%	96.7%	98.4%	95.7%	94.9%	90.3%	96.4%
	other improved sources	7	15	12	3	9	2	16	6	7	77
		1.2%	5.2%	6.6%	1.5%	3.0%	1.6%	4.3%	5.1%	9.7%	3.4%
	unimproved sources	1	0	1	1	1	0	0	0	0	4
		.2%	.0%	.5%	.5%	.3%	.0%	.0%	.0%	.0%	.2%
	Total	568	288	183	206	305	124	371	118	72	2235
		100%	100%	100%	100%	100%	100%	100%	100%	100.0%	100.0%

Appendix 2 Distance to main source of water by gender and population group

Gender	Distance	Population group of head of household				
		Black	Colored	Indian	White	Total
Male	Less than 200m	2105	97	3	14	2219
		51.7%	75.8%	100.0%	70.0%	52.6%
	Between 210m - 500m	1269	27	0	3	1299
		31.2%	21.1%	.0%	15.0%	30.8%
	Between 501m - 1km	423	4	0	1	428
		10.4%	3.1%	.0%	5.0%	10.1%
	More than 1km	267	0	0	1	268
		6.6%	.0%	.0%	5.0%	6.3%
	Don't know	6	0	0	1	7
		.1%	.0%	.0%	5.0%	.2%
	Total	4070	128	3	20	4221
		100.0%	100.0%	100.0%	100.0%	100.0%
Female	Less than 200m	2102	22	1	3	2128
		45.4%	71.0%	50.0%	75.0%	45.5%
	Between 210m - 500m	1519	8	0	1	1528
		32.8%	25.8%	.0%	25.0%	32.7%
	Between 501m - 1km	661	1	0	0	662
		14.3%	3.2%	.0%	.0%	14.2%
	More than 1km	345	0	1	0	346
		7.4%	.0%	50.0%	.0%	7.4%
	Don't know	8	0	0	0	8
		.2%	.0%	.0%	.0%	.2%
	Total	4635	31	2	4	4672
		100.0%	100.0%	100.0%	100.0%	100.0%

Appendix 3 Distance to main source of water by gender and province of residence

Gender of		Province									
		WC	EC	NC	FS	KZN	NW	G	M	L	Total
Male	Less than 200m	127	480	70	96	551	269	169	146	312	2220
		83.6%	58.6%	79.5%	71.1%	37.9%	58.2%	74.1%	49.7%	52.8%	52.6%
	Between 210m - 500m	21	196	13	33	552	155	40	99	191	1300
		13.8%	23.9%	14.8%	24.4%	38.0%	33.5%	17.5%	33.7%	32.3%	30.8%
	Between 501m - 1km	3	79	4	3	208	28	17	32	54	428
		2.0%	9.6%	4.5%	2.2%	14.3%	6.1%	7.5%	10.9%	9.1%	10.1%
	More than 1km	0	64	1	3	140	9	2	15	34	268
		.0%	7.8%	1.1%	2.2%	9.6%	1.9%	.9%	5.1%	5.8%	6.3%
	Don't know	1	0	0	0	3	1	0	2	0	7
		.7%	.0%	.0%	.0%	.2%	.2%	.0%	.7%	.0%	.2%
	Total	152	819	88	135	1454	462	228	294	591	4223
		100%	100%	100%	100%	100.%	100.%	100.%	100.%	100.%	100.0%
Female	Less than 200m	38	528	18	44	646	277	79	98	401	2129
		67.9%	52.5%	72.0%	73.3%	32.7%	62.2%	75.2%	50.8%	49.5%	45.6%
	Between 210m - 500m	16	286	6	13	719	142	20	75	251	1528
		28.6%	28.5%	24.0%	21.7%	36.4%	31.9%	19.0%	38.9%	31.0%	32.7%
	Between 501m - 1km	2	121	1	2	400	19	4	11	102	662
		3.6%	12.0%	4.0%	3.3%	20.3%	4.3%	3.8%	5.7%	12.6%	14.2%
	More than 1km	0	70	0	1	205	6	2	9	53	346
		.0%	7.0%	.0%	1.7%	10.4%	1.3%	1.9%	4.7%	6.5%	7.4%
	Don't know	0	0	0	0	4	1	0	0	3	8
		.0%	.0%	.0%	.0%	.2%	.2%	.0%	.0%	.4%	.2%
	Total	56	1005	25	60	1974	445	105	193	810	4673
		100.%	100.%	100.%	100.%	100.%	100.%	100.%	100.%	100.%	100.0%