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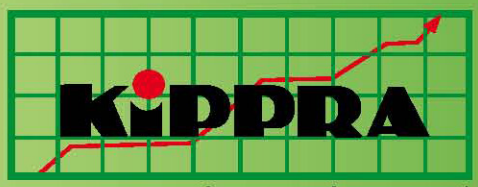


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# Gendered Access to Energy and Water and its Implications on Well-being in Kenya

James Gachanja

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THE KENYA INSTITUTE FOR PUBLIC POLICY
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**Kenya Institute for Public Policy Research and Analysis**

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## Abstract

*Gendered access to water and energy is an important factor in determining outcomes and opportunities in households. This paper sought to measure gender differences in access to water and energy and examine how this affects well-being of women and men. To measure well-being, a multi-dimensional poverty index was computed with dimensions covering: standard of living, economic engagement, education and health. A logistic regression methodology was followed to predict the well-being of an individual based on gendered access to water and energy. Two separate models were tested for men and women. The results show that women's well-being is disproportionately adversely affected by lack of access to water than men. Regarding access to energy, the time spent getting energy from a source was found to be non-significant in influencing the probability of being multi-dimensionally poor. To safeguard well-being, it is recommended to prioritize investment in interventions that will reduce the time spent by women in accessing water. There is need for gender targeting in interventions, programmes and projects geared towards enhancing access to water and energy.*

## Abbreviations and Acronyms

| | |
|---|---|
| KIHBS | Kenya Integrated Household Budget Survey |
| MPI | Multi-dimensional Poverty Index |
| SDGs | Sustainable Development Goals |
| UNDP | United Nations Development Programme |

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# 1. Introduction

The ability to access quality energy and water infrastructure is an important aspect of opportunity that allows all people to work towards fulfilling their potential (UN/DESA, 2015). Adequate access to water and energy can deliver improved living conditions, health outcomes and productivity for women (UN-Habitat, 2007; Rathi and Vermaark, 2018). The quality and level of service of water and energy services influences the well-being of men, women, boys and girls differently (Moser, 2012; Winther et al., 2018). As Winther et al. (2018) points out, this difference is associated with the gender defined roles and needs of women and men in a society and the convenience that infrastructure provides in undertaking those roles. Chant (2012) notes that gender inequalities are interrelated with inequalities in housing in a bidirectional way. Gender inequalities influence who owns or controls housing, while housing attributes such as access to water, energy and tenure affect gender relations with regard to power, rights and gender division of labour.

A review of gender division of labour and roles reveals, for example, that in developing countries, rural women divide their time between domestic work, childbearing/caring, farming and non-farm activities (Carr and Hartl, 2010). Lack of access to infrastructure such as water and energy increases the time spent on domestic activities by women, and reduces time allocated to productive non-domestic or non-farm economic opportunities. A report by UNDP (2016) highlights this fact more succinctly; it notes that in Africa, women spend twice as much time as men on domestic work such as fetching water and wood. It is estimated that they spend 40 billion hours each year collecting water, an amount equivalent to a year's worth of labour by the entire workforce in France. Improving access to water and energy could lead to approximately 900 hours or year work reductions for women.

In Kenya, 27.7 per cent of adult females are responsible for collecting water compared to 16.4 per cent adult males in urban areas while in rural households, collection of water is done by female's with 56.8 per cent compared to males at 11.8 per cent. At the national level, nearly 3 in 10 households (28%) spend 30 minutes or longer to obtain their drinking water (KNBS, 2014). A similar scenario prevails in the energy sector where women and children in some parts of Kenya spend increasing amounts of time fetching firewood and other biomass fuels, leaving little time for other productive activities (Government of Kenya, 2004) According to the Kenya Integrated and Household Budget Survey (KHIBS ) 2015/16, 84 per cent of households in rural areas use wood as the main source of cooking fuel. This adversely affects the health of women due to their role in cooking, and is linked to high prevalence of Acute Respiratory Infections (KNBS, 2014).

The statistics point to the prevailing gender inequality driven by inadequate access to water and energy services. It also highlights that gender gaps in accessing water and energy disproportionately affects women's well-being and, therefore, the need for increased investments in infrastructure to reverse this. Such investment in urban and rural set ups is instrumental in achieving gender equality, economic growth and development (Parikh et al., 2015).

Research on access to water and energy and gender development has established macro-critical gender issues that need to be considered, such as gender inequality in outcomes and opportunities. Inequalities in outcomes in this context include, for instance, gaps in incomes and labour force participation. The examples of related inequalities in opportunities include gaps in access to basic infrastructure and enablers of economic participation (IMF, 2018).

Housing and the attendant infrastructure can be a gender "equalizer" and driver of development if properly planned, located, designed and priced. It is noted that infrastructure policies and projects that target and are designed to reach those who are most in need (or those who solely rely on the infrastructure service) are likely to succeed in improving livelihoods and lift the income levels of the poor (Oparaocha and Dutta, 2011). Globally, it is acknowledged that enhancing access to housing infrastructure services such as energy is fundamental to improving the quality of life and economic development (Word Economic Forum). It is therefore important to understand the roles, responsibilities, priorities and needs of women and men when planning the provision of housing infrastructure to address gender-specific needs and expectations for sustainable development, and gender responsiveness.

Kenya's development agenda, the Vision 2030 (Government of Kenya, 2008), the "Big Four" agenda on affordable housing (Government of Kenya, 2018) and the global Sustainable Development Goals (SDGs) identify equality and fairness in provision of housing and infrastructure as key development priorities. SDG 11 provides the goal for countries to make cities and human settlements inclusive, safe, resilient and sustainable. The target is to enhance equal access to infrastructure and services such as housing, water, transport and energy. Nationally, the economic and social right of every Kenyan to decent, adequate housing and reasonable standards of living is provided for in policy and law. For instance, the Government's "Big Four" agenda is, among others, tailored to ensure that Kenyans enjoy these rights, through construction of 500,000 affordable homes in all major cities by 2022. As the country embarks on implementing these projects, it will be important to evaluate the impact on issues such as inclusivity and equality for sustainable development.

Two important policy questions arising from this discourse are: what are the links through which gender gaps in access to water and energy affect well-being? And what are the drivers of such gaps?

One emerging response to the first question is based on the roles of men and women in obtaining water and energy. In most communities, it is a woman's role. Thus, the time and effort spent accessing these resources takes up the time that would have been allocated to productive work and leisure. This translates to time poverty and low labour participation by women, thus undermining the overall potential of the household to generate income. Policy interventions advanced to address these issues have included measures to reduce the costs related to accessing work outside the home and measures to free up women's time for work outside the house (Gibson and Olivia, 2010). However, there exists gaps due to lack of gender responsive polices, plans and projects. This paper seeks to explore the gender gaps in access to water and energy and examine how these are associated to well-being in households.

## 1.1 Research Questions

(i) What are the gender differences in relation to access to water and energy?

(ii) To what extent does access to water and energy affect household well-being?

## 1.2 Objectives

The overall objective is to establish the implications that gender gaps in access to water and energy have on well-being. The specific objectives are:

(i) To measure gender differences in relation to access to water and energy

(ii) To estimate the effect of gender differentiated access to water and energy on household well-being.

# 2. Literature Review

## 2.1 Theories Underpinning Gender, Poverty and Access to Water and Energy

The link between gender, poverty and access to basic infrastructure services such as water and energy can be explained and understood from existing theoretical perspectives. Understanding how households allocate time to work and non-work activities is useful in drawing the link between poverty, gender and access to water and energy. The household production, and allocation time theory and models consider that time spent in activities have a cost, and that households seek to substitute towards less time-intensive means of production when the opportunity cost is higher (Becker, 1965; Huffman, 2010). In addition, Becker (1965) holds that more attention should be paid to efficiency and allocation of foregone earnings, since they are found to be quantitatively important and are primarily determined by the use of time. Time is an economic resource which individuals may allocate to each activity differently, leading to different levels of utility.

Theory also holds that different allocations of time have different values that may be measured in money terms (González, 1997). In relation to this, Bardasi and Wodon (2006) refer to the concept of time-poverty. Time-poverty when viewed in the context of gender roles can highlight gender inequality at the household level (Moser, 2012). Based on this theory, the time spent accessing water and energy by women and men is therefore an important variable in explaining household production, equity and outcomes. It informs how we value productive roles and how we perceive or value reproductive roles and non-working time, such as childbearing, household chores and leisure (Becker, 1965; Moser, 2012; Winther et al., 2018).

Neoclassical theories hold that poverty can be explained by unequal initial endowments of talents, skills and capital, which determine productivity of an individual in competitive economic systems. According to this view, poverty can be explained by lack of social capital and private assets, barriers to education and barriers to employment (Davies and Sanchez, 2015). Based on this, it can be argued that lack of household access to water and energy affects household allocation of time to productive and reproductive activities. This acts as a barrier to education and employment, consequently contributing to poverty.

The human capital theory, which falls under the neoclassical perspective, places importance on education and set of skills workers are equipped with in the labour market and how these affect incomes. It holds that individual choices in relation to education, training and mobility are determinants of human capital that can explain differences in incomes (Davies and Sanchez, 2015; McKernan and

Ratcliffe, 2002). This theory can be applied in explaining the link between access to water and energy, human capital development and poverty through household time use. The aspect of gender differences can be factored where the roles and responsibilities of household members are understood with respect to access to water and energy.

The Keynesian and neoliberal theories emphasize on public goods and inequality in explaining poverty. This view holds that economic prosperity is founded on providing public capital towards enhancing physical and human capital. According to this perspective, under-development is explained by poor levels of infrastructure such as transport, power and sanitation, among others (Davies and Sanchez, 2015; Sachs, 2006). Therefore, if there is inadequate access to water and energy, that could translate to poverty and under-development.

The Marxian view, which is underpinned in part by the concept of class, introduces the idea of inequality and discrimination in explaining poverty. Inequality in this case is defined as a situation resulting from differential access to valued resources by some groups due to structural factors beyond their control, such as gender (Davies and Sanchez, 2015) and to some extent by social-geographical factors or location (Peet, 1975). Further, Hägerstrand's time-space model also explains transmission of inequality, even across gender, with respect to household residence location, resources and opportunities - by describing the daily life environment (Peet, 1975). Linked to this are the social exclusion and social capital theories that focus most on understanding the central processes that allow deprivation to arise and persist. The concept of social exclusion views poverty as non-participation in consumption, production, political engagement and social interaction (Davies and Sanchez, 2015). From this view, the differentiated access to water and energy by women and men for instance in urban and rural areas is therefore a case of inequality, which can translate to exclusion.

The capabilities approach as advanced by Sen (1990) and Fukuda-Parr and Kumar (2003) focuses on capabilities; that is, what people can do and be, as opposed to the income they receive in explaining well-being. According this view, the goal of development is to enhance human capabilities or the freedom one has in terms of choice of functionings. Based on this perspective, the link between gender, poverty and energy and water is manifest in how access influences the capabilities of people and affects their freedoms, quality of life and overall well-being.

## 2.2 Gender, Water, Energy and Poverty Nexus

Energy and water poverty have been shown to affect men and women differently, which confirms the notion that a nexus exists between gender, poverty and energy

and water access (Clancy et al., 2003). Energy poverty is defined as the absence of enough choice in accessing adequate, affordable, reliable, energy services (Clancy et al., 2003; Day et al., 2016; Acharya and Sadath, 2019). Water poverty is defined as situation where a nation or region cannot afford the cost of sustainable clean water to all people at all times (Feitelson and Chenoweth, 2002; Molle and Mollinga, 2003). It has also been defined as a situation where households spend more than 3 per cent of their net income after housing costs on water (Bradshaw and Huby, 2013). The nexus between poverty, water and energy assumes a gender dimension, first given that there are more women than men living in poverty (Clancy et al., 2003) and second because often it is the responsibility and role of women to fetch water and provide energy (Clancy et al., 2003; Sorenson et al., 2011). The link between access to energy and water to poverty and gender is also tied to food security and prices; livelihoods and income; and basic needs and amenities, including health (Saleth et al., 2003).

The nexus between access to energy and water to poverty and gender has also been associated to household division of labour and allocation of roles between men, boys, women and girls with regard to access to resources, decision-making, and control (Clancy et al., 2003; Khosla and Pearl, 2002). An understanding of the power relations between men and women, who makes the decisions about energy and water within the household and who benefits is therefore important in explaining this nexus (Clancy et al., 2003; Johnson et al., 2019; Listo, 2018; Annecke, 1999; Khosla and Pearl, 2002).

The gender, water, energy and poverty nexus call for investigation of the implications for women and men regarding use of water and energy, sources of water and type of energy and who uses these resources (Clancy et al., 2003; Listo, 2018; Sunikka, 2019). Literature shows that there are different implications for men and women regarding access to water and energy. Health-related implications are identified in Geary et al. (2014), Sorenson et al. (2011), Schmidlin et al. (2013) and Stevenson et al. (2012). In addition to health-related implications are also economic, productivity and poverty implications (Bajracharya et al., 1993; Molle and Mollinga, 2003; Khosla and Pearl, 2002; Bisunga and Elliott, 2018) while implications on inclusion, voice, agency and gender inequality are identified in (Adams et al., 2018).

Approaches to addressing the gender, energy, water and poverty nexus have advocated for planning that focuses on energy and water services, and the capabilities that access to energy provides (Clancy et al., 2003; Day et al., 2016; Khosla and Pearl, 2002). Applying the capabilities approach, there is need to go beyond focusing on access to water and energy services only by considering what the services are for, or what they can enable one to achieve (Day et al., 2016).

Therefore, emphasis should be on analyzing the energy and water needs of men and women that would support their livelihood functions, including poverty reduction, while considering their constraints and opportunities (Day et al., 2016; Listo, 2018; Sunikka et al., 2019; Khosla and Pearl, 2002). In addition, when measuring the gender inequalities regarding poverty, Espinoza and Klasen (2018) propose that intra-household inequalities should be measured to determine the multi-dimensional poverty condition of each household member. This approach is more effective in identifying gender inequalities with the household.

## 2.3 Gender in the Energy and Water Sector Policies in Kenya

Kenya has a robust framework on issues dealing with access to energy and water, in the form of policy documents and sessional papers. A review of the Energy Policy (Government of Kenya, 2004) and Water Policy 1999 reveals that both policies recognize gender gaps in the respective sectors. Sessional Paper No. 4 of 2004 on Energy policy acknowledges that there is evident gender imbalance in the management of the energy sector, which is dominated by men. The policy notes that production and use of biomass fuels and access to energy is gender role borne by women. It provides for mainstreaming gender issues in policy formulation and in energy planning, production and use. It states that the Government shall take deliberate steps to integrate female gender in policy formulation and management of the energy sector. The policy further makes provision for public education and awareness creation on the cultural structures and practices hindering access by women to biomass fuel resources, and education on appropriate use of biomass fuels and promotion of the use of fuel-efficient biomass cook stoves. Despite these provisions, plan, programmes and projects in the energy sector are deemed to be gender neutral.

Sessional Paper No. 1 of 1999 on National Water Policy on Water Resources Management and Development identifies the role played by women in water provision, management and use (Government of Kenya, 1999). It provides for gender-balanced training on water in communities to allow for gender factors to be reflected in the ownership and management of the various water schemes operated by communities. It also provides for institutional reforms, change in behaviour, attitudes and procedures to ensure participation of women in water sector institutions. Further, the National Water Services Strategy 2007-2015 is cognizant of the fact that "the burden of fetching water in most rural areas is borne by women and children for whom there is no time to attend school regularly because of the obligation to secure water for the household." It also identifies that women and children are among the poorest in society and are the most affected where water, sanitation and sewerage (WSS) services are inadequate.

Consequently, the strategy notes that improved service (water) conditions in low-income areas will particularly enhance the living conditions of women and children. The strategy seeks to ensure increased participation and representation of women in decision-making and planning in water service provision agencies. Despite this, available statistics indicate prevailing gender inequalities with regard to access, use and management of water.

## 2.4 Who Benefits from Access to Energy and Water?

Lack of access to infrastructure and poor infrastructure such as electricity, water and roads affects household income and constrains participation of households in productive activities. Gibson and Olivia (2010) examined the relationship between rural infrastructure provision and non-farm self-employment and income in Indonesia. They applied cross-sectional analysis involving tobit, probit and regression analysis. The analysis found that poor infrastructure–lack of access to electricity, power blackouts, and low-quality roads–constrained engagement of household in no-farm enterprises and lowered household income. The lack of access to infrastructure was found to affect women and men differently, thus perpetuating gender inequalities.

Rathi and Vermaak (2018) estimated the extent to which rural electrification affects employment and earnings for women, and how it promotes inclusive and sustainable growth in India and South Africa. The analysis made use of panel data to undertake propensity score matching. They found that access to electricity raises the annual incomes from paid employment for both men and women. However, once a woman is employed, their increase in earnings exceed that of men. Furthermore, women benefited most from the productivity gains of electrification. The analysis found that the benefits of electrification depended on gender roles. Similar arguments can be found in a number of empirical studies (see for example Moser, 2012; Khosla and Pearl, 2002; Pachauri and Rao, 2013). It was also found that the quality of electricity supply was important in determining the benefits of electrification.

These findings are supported by the work of Parikh et al. (2015), who examined the relationship between infrastructure provision and poverty alleviation in India. They used mixed methods in the analysis, including qualitative ethnographical techniques and quantitative multivariate regression. Their study found that infrastructure was associated with a 66 per cent increase in education among females. Service provision increased literacy by 62 per cent, enhanced income by 36 per cent and reduced health costs by 26 per cent. The study recommends gender sensitive project design and implementation to target women on account of their reproductive roles in the household.

Fingleton (2018) explored how men and women's roles in society are reflected in the way they use and perceive energy in Kenya. The analysis was based on household utility theory using in-depth interviews and thematic network analysis. It was found that women benefit more from access to modern energy in households than men do, and this was mainly by making their chores easier. The analysis found that men's role in making household spending decisions adversely affected uptake of modern energy technologies that benefit women.

In relation to this, accessing modern energy technologies has been found to be important to the health and well-being of women and children (Mengersen et al., 2011). It has been shown that respiratory illnesses are positively associated with a range of indoor exposures, including cooking, fire and smoke, which are determined by the type of energy used in the household (Mengersen et al., 2011).

Winther et al. (2018) examined the gendered implications of various types of electricity access in rural Kenya. Based on socio-technical system theory, social practice theory and women empowerment frameworks, the study conducted in-depth interviews and focus group discussions. They found that gender influences electricity supply, with men dominating grid, mini-grids and private supply systems, to the exclusion of women. It was also found that there are gender inequalities in access to electricity linked to home ownership, because men own houses, earn more income and make household decisions.

It has been shown that access to water and energy influences time use in households and consequently household income and expenditure (Bisunga and Elliott, 2018). Bisunga and Elliott (2018) examined the relationship between improvement in access to safe water supply and water insecurity, household time savings and allocation and household water expenditure in Kenya. They applied linear regression models for analysis. The analysis found a positive relationship between improvements in water supply and time and money savings. They found time savings of 50 minutes per trip and money savings of Ksh 30 in a day due to improved access to water. Female-headed households reported 1.15 points less on the water insecurity scale than male-headed households. It was also found that there is a strong and positive association between time spent on water collection and water insecurity, while household wealth was negatively associated with water insecurity. The Inter-agency Task Force on Gender and Water 2006 provides more information on the inter-relationship between gender and water and the role of policy.

In summary, the body of empirical literature and findings emphasize the need to ensure that policies, programmes and projects are "gender sensitive" and not "gender neutral" to deliver shared benefits. The benefits of access to energy and water depend on gender roles, which affect women and men differently.

## 2.5 Association between Well-being and Individualized Gendered Access to Water and Energy

Based on the literature, it is shown that there exists an association between well-being and access to energy and water (Gibson and Olivia, 2010). The level of access to these basic services significantly affects welfare of individuals in terms of hygiene, health and the amount of time that households allocate to daily activities and expenditure (Parikh et al., 2015). Adequate access to these services frees-up time for people to engage in other productive economic activities (Parikh et al., 2015; Bisunga and Elliott, 2018). Conceptually, the theoretical and empirical literature identify a relationship between well-being and access to water and energy (where access is measured as time spent).

# 3. Methodology

## 3.1 Measuring Well-being: Dimensions, Indicators, Cut-offs and Weights

Various approaches have been used to measure well-being and explain poverty. Income or consumption expenditure-based approaches have been relied upon over time to explain poverty. However, new theoretical and methodological advancements have dispelled the effectiveness of income-based measures. One key argument against the income measures is that, by essence, income is just but one dimension of welfare and well-being. The income-based approaches have been deemed inadequate because poverty has been theorized to involve more than purely income dynamics (Alkire and Foster, 2011). In place of the uni-dimensional income-based measures, multi-dimensional measures have been advanced, given their superior analytical power. In the multi-dimensional poverty approach, poverty is seen to be influenced by concepts such as fulfillment of basic needs, material deprivation, subjective well-being, and the capability approach. In this paper, we develop a multi-dimensional poverty index following the work in Espinoza and Klasen (2018), Alkire et al. (2017) and Alkire and Foster (2011). We adopt four dimensions to study poverty (well-being). These include health, education, standard of living and economic engagement. Table 3.1 provides a summary of the dimensions, indicators, cut-offs and weights used in the analysis.

The first dimension we use is health, which is chosen to represent well-being. As stated in Robeyns (2003), good health influences other capabilities, with those suffering bad health having limited capability to participate in economic and social activities. The health dimension is captured by the health functioning indicator in which a household member is deemed deprived of if they have suffered from a chronic disease or eruptive disease or diarrhea or several diseases in the past four weeks. This has been applied in Espinoza and Klasen (2018) and Rippin (2016).

The second dimension is education, which is also important to well-being as it influences other capabilities such as occupational choice and future income (Robeyns, 2003). Two indicators are selected to measure this dimension; i.e. school achievement where an adult is deprived if they have not completed lower secondary school; and child school attendance where any school-aged child is not attending school up to the age at which they would complete class 8 (Espinoza and Klasen, 2018; UNDP, 2018; Rippin, 2016; Yu, 2013). In Kenya, universal education has been adopted as a policy agenda at lower and upper school. Kenya acknowledges provision of basic education for its citizens as a human right, as is enshrined in the Constitution of Kenya 2010. The national development policy,

Kenya Vision 2030, further acknowledges the role of access to education in economic and social development.

The third dimension of well-being identified is economic engagement. It is acknowledged that access to decent jobs and the income earned by individuals play a part in alleviating poverty (Espinoza and Klasen, 2018; Rippin, 2016; Yu, 2013). We formulate two indicators to measure this dimension, namely employment status where an adult is deprived if they are unemployed or are discouraged workers or are engaged in unpaid domestic work (he or she is unemployed but is not looking for a job because of being a housewife / has family responsibilities; child care problems). The second indicator relates to income, recognizing that income-based measures of poverty are relevant in multi-dimensional poverty measures (Rippin, 2016; Yu, 2013). Using consumption expenditure as a proxy for income, an individual is defined as deprived if the monthly per adult equivalent total consumption expenditure is below absolute poverty line using food poverty line and Ravallion method. In Kenya, this stands at Ksh 3,252.7 for rural areas and Ksh 5995.9 for urban areas (KNBS, 2016).

The fourth dimension identified in the paper is the standard of living, which is driven by housing conditions within which individuals live. Robeyns (2003) argues that this dimension influences mainly the capabilities of bodily health and affiliation, noting that access to adequate shelter is an important element of well-being. Six indicators are defined to measure well-being under this dimension, these are: access to electricity for lighting; access to modern energy sources for cooking; access to improved sources of water; access to improved sanitation; housing tenure (ownership); and occupation of house built, with finished (non-precarious) materials for roofing, floor and walls. An individual is deprived if they lack access to these housing conditions (Alkire et al., 2017; Espinoza and Klasen, 2018; UNDP, 2018; Rippin, 2016; Yu, 2013). Kenya aspires to provide adequate and decent housing for its people; this is outlined in the "Big Four" agenda national priorities for development between 2017 and 2022. The agenda on provision of affordable housing is anchored on national principles of human dignity enshrined in the Constitution of Kenya and the SDGs.

We use a weighting approach as applied in Yu (2013) which is presented in table 3.1. In a nested weighting structure, the overall weight is first split equally between dimension 1 and the remaining dimensions, and then the weight allotted the second group is allocated equally across the dimensions. A cut of 0.33 is applied in the analysis following Alkire and Foster, 2011. The cut (K=33%) means that we identify someone as poor if he or she is deprived in 33% or more of the weighted indicators. It is important to test for correlation among the indicators in the multi-dimensional poverty index, and we achieve this through Spearman's correlation

(Alkire and Foster, 2011). For policy analysis and discussion, the multi-dimensional poverty index is decomposed by dimension, indicator, sex, and by region (county) Espinoza and Klasen, 2018; Yu, 2013; Alkire et al., 2017). Robustness tests are necessary when developing an MPI, and this is done by adjusting the dimensions, weights and cut off as practiced in (Espinoza and Klasen, 2018; Yu, 2013).

**Table 3.1: Dimensions, indicators, cut-offs and weights**

| Dimension | Deprived if … | Weights |
|---|---|---|
| 1. Health | Health functioning(V1): household member has suffered from a chronic disease or eruptive disease or diarrhoea or several diseases in the past four weeks | 0.25 |
| 2. Education | School achievement (V2): Adult deprived if has not completed lower secondary school | 0.125 |
| | Child school attendance (V3): Any school-aged child is not attending school up to the age at which they would complete class 8 | 0.125 |
| 3. Economic engagement | Employment status (V4): Adult is unemployed; a discouraged worker; and an unpaid domestic worker (he or she is unemployed but is not looking for a job because is a housewife / has family responsibility; Childcare problems | 0.125 |
| | Consumption monetary measure (V5): monthly per adult equivalent total consumption expenditure is below absolute poverty line using food poverty line and Ravallion method (rural = Ksh 3,252.7; Urban= Ksh 5,995.9) | 0.125 |
| 4. Standard of living | Housing material (V6): Living in a house with natural and rudimentary walls or floor or roof | 0.0416 |
| | Access to water (V7): Deprived if there is no access to tap in house or yard | 0.0416 |
| | Access to electricity (V8): Not using electricity as the main source of lighting | 0.0416 |
| | Access to improved cooking fuel (V9): Using firewood; kerosene; charcoal; straw/shrubs/grass; animal dung; agricultural crop residue. | 0.0416 |

| | | |
|---|---|---|
| | Access to improved sanitation facilities (V10): if toilet facilities are shared; flush toilet somewhere or unknown place; bucket toilet; hanging toilet/ hanging latrine; no facility/bush/field | 0.0416 |
| | Housing tenure (V11): Living in a dwelling for no rent-squatting | 0.0416 |

*Source: Author's compilation*

### 3.2 Defining Gendered Access to Water and Energy

Gendered access to water and energy is explained by using theoretical literature on household allocation of time (Becker, 1965; Huffman, 2010; González, 1997; Bardasi and Wodon, 2006) and the gender division of labour as discussed in (Moser, 2012; Winther et al., 2018). Access to water is measured in terms of time spent getting water in minutes (return trip). To capture the gender differentiation, the data is analyzed at individual household member level (male and female) based on the person responsible for fetching water in the household. A similar approach is applied for energy access, but in this case the micro-dataset provided gendered disaggregated data time spent accessing energy from source.

### 3.3 Associating Well-being with Gendered Access to Water and Energy

The association of well-being with gendered access to water and energy was estimated using logit regression analysis. A similar approach is adopted in Zhao et al. (2019). This helps in understanding the likelihood of being poor using a gender lens, while focusing on our variable of interest, i.e. access to water and energy (Espinoza and Klasen, 2018). The gender differentiation was achieved by disaggregating the variable time spent by women and men accessing water and energy within the KIHBS 2015/16 data set. A set of control variables that also explain well-being were identified in literature and applied in the analysis (Achia et al., 2010; Fadipe et al., 2014; Miles, 1997; Olale and Henson, 2012; Paweenawat and McNown, 2014; Woolard and Klasen, 2005; Pede et al., 2011; Talukder, 2014; Tuyen, 2015; World Bank, 2005) as shown in Table 3.2.

### 3.4 Data

The analysis uses data from the Kenya Integrated Household Budget Survey (KHIBS) 2015/16. KHIBS is a population-based survey of a sample of 24,000

households, covering the national and county level and across urban and rural areas. The sample was drawn from the fifth National sample survey and Evaluation Programme (NASSEP V) household sampling frame as described in KNBS (2018). This study relied on data drawn from questionnaires on household member's information (1A); household level information (1B); and energy module data.

**Table 3.2: Applicable variables from KIHBS 2015/16**

| Variables | Description | Expected sign |
|---|---|---|
| Dependent variable | | |
| Well-being (MO) | Adjusted multidimensional poverty headcount ratio-multi dimensionally poor 1-yes; 0-No (computed MPI) | |
| Variables of interest to gendered access to water and energy | | |
| j35_w | Time spent getting energy source per day in minutes – by women | + |
| j35_m | Time spent getting energy source per day in minutes – by men | + |
| w-water | Time spent getting water in minutes (return) – by women | + |
| m-water | Time spent getting water in minutes(return) – by women | + |
| Control variables | | |
| MaritStat | Marital status of household head: never married=0; married or living together=1; divorced, widowed, separated =2; polygamous =3 | - |
| AgeHHH | Age of household (hh) head | - |
| EDUHHH | Education of hh head by qualification: none=0; primary-cpe/kcpe/kape=1; secondary(kjse/kce/kcse/kace/eaace) =2; certificate&diploma=; degree& post-graduate=4; basic=5 | - |

| | | |
|---|---|---|
| EmpHHH | Employment of the hh head: 0=Others (intern, apprentice, volunteer); 1=wage employment; 2=self-employed trade activities; 3=self-employed Farm based=3 | |
| hhsize | Total persons in household | + |
| i02 | Home ownership (1=Owns; 2=Pays rent/ Lease; 3= No rent with consent of owner; 4 =No rent, squatting | +/- |
| eatype | Enumeration area /region variable: 1=rural; 2=urban; 3=peri-urban | -/+ |

# 4. Results and Discussion

## 4.1 Estimating Well-being using the MPI

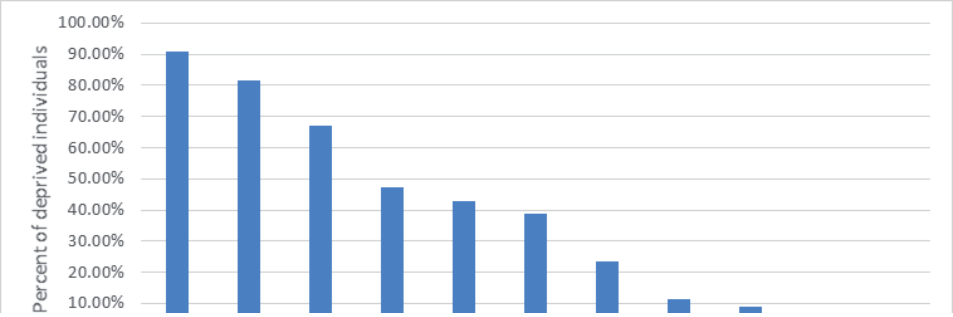
### 4.1.1 Correlation of MPI indicators

We investigate the bivariate correlations across indicators chosen for measuring multidimensional deprivation to determine if they can reasonably be applied in the analysis. Table 4.1 reports the results of Spearman's correlation, which show that most coefficients have low correlation, with the highest being 0.41 (deprivation in house building material and access to electricity for lighting). Based on the correlation coefficients, the indicators can be applied in the MPI analysis

### 4.1.2 Aggregate deprivation by indicator

Results from the MPI analysis depicting the proportion of deprived individuals by indicator are presented in Figure 2. The results show that lack of access to clean energy sources for cooking is the most predominant form of deprivation, while housing tenure is the least dominant. According to the results, close to 90 per cent of individuals are deprived, with respect to access and use clean energy for cooking. This is followed by lack of access to improved sources of water for drinking at (77%) and Adult School Achievement at 53 per cent. It is important to note that in Kenya, these indicators associated with access to infrastructure and social services are more pronounced forms of deprivation amongst the population than the monetary measures of deprivation. This is despite Government policies on access to clean energy, access to water and strategies in the education sector for

**Figure 4.1: Percentage of individuals whose indicator values are below threshold**




*Source: Author's compilation*

**Table 4.1: Spearman's correlation**

| | Health-Fnct | AdultSch Achv | ChildS-chAttnd | EconEng | Money-PovtR | HseMat | HseTen | AccesWa-terDr | Ac-ces-Sant | Acce-sEleclit | Acce-sEnerCk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| HealthFnct | 1 | | | | | | | | | | |
| AdultSchAchv | 0.0219 | 1 | | | | | | | | | |
| ChildSchAt~d | -0.0146 | 0.0386 | 1 | | | | | | | | |
| EconEng | 0.0043 | -0.2372 | -0.0077 | 1 | | | | | | | |
| MoneyPovtR | -0.0555 | 0.2135 | 0.0269 | -0.0941 | 1 | | | | | | |
| HseMat | -0.0121 | 0.2547 | 0.0187 | -0.1526 | 0.2666 | 1 | | | | | |
| HseTen | -0.0136 | 0.0033 | 0.0041 | 0.0065 | 0.0067 | -0.0026 | 1 | | | | |
| AccesWaterDr | 0.0038 | 0.1181 | 0.0091 | -0.0878 | 0.115 | 0.2717 | -0.0031 | 1 | | | |
| AccesSant | -0.0206 | 0.1132 | 0.0444 | -0.0701 | 0.1655 | 0.267 | 0.0111 | 0.1215 | 1 | | |
| AccesEleclit | -0.0026 | 0.2589 | 0.0268 | -0.1083 | 0.2671 | 0.418 | 0.0092 | 0.2242 | 0.2156 | 1 | |
| AccesEnerCk | 0.0079 | 0.2826 | 0.0097 | -0.1716 | 0.2073 | 0.2618 | 0.0041 | 0.1081 | 0.0821 | 0.2856 | 1 |

*Source: Author's computation based on survey data*

universal access. The analysis highlights the need for adopting multi-dimensional measures of well-being.

### 4.1.3 Aggregate indicators of multi-dimensional poverty

The main indicators of multidimensional poverty, that is the incidence (H), Intensity (A) and MPI (MO), using a cut-off of 0.33 are presented in Table 4.2. The main output of interest is the adjusted multi-dimensional headcount ratio (MO). For interpretation, this is the proportion of deprivations poor people experience, as a share of the possible deprivations that would be experienced if all people were deprived in all dimensions. MO is a product of the proportion of people who are poor, indicative of the incidence of poverty (H); and the average deprivation score, which is the proportion of dimensions in which poor people are deprived, indicative of the intensity of poverty. The results indicate that 19.8 per cent of the population are multi-dimensionally poor, with an incidence of 45.6 per cent. The intensity of deprivation is 43.4 per cent.

**Table 4.2: Measures of multi-dimensional poverty**

| Coef. | Std. Err. | [95% Conf. | Interval] | |
|---|---|---|---|---|
| Head count ratio -H (incidence)-proportion of poor | 0.456 | 0.002 | 0.452 | 0.459 |
| Average deprivation score-A-intensity | 0.434 | 0.001 | 0.433 | 0.435 |
| MPI-The adjusted multidimensional headcount ratio-M0 | 0.198 | 0.001 | 0.196 | 0.199 |
| N = 67,612 | | | | |

### 4.1.4 Gender analysis of multi-dimensional poverty indicators

Given the gender focus of this paper, the MPI is decomposed by sex as presented in Table 4.3. The findings reveal that within population, the proportion of multidimensional poor men is 20.89 per cent, which is higher than the proportion of poor women at 19.04 per cent while in the MPI, the male gender is marginally worse off by 0.5 per cent. Further analysis by gender of household head shows a difference in absolute MPI, where female headed households are marginally worse off (female headed hh=0.176; male =0.175). When we look at the per cent contribution of men and women to the indices, we find that men contribute 52.5

per cent to MPI compared to women at 47.5 per cent. However, the contribution of men and women to the MPI differs by indicators and dimension; that is, there are some dimensions within which women are more deprived than men and vice versa. For instance, we see that women are worse off in the social dimensions of health and education compared to men. Men are worse off in the economic and living standards. On the indicators of focus, that is energy and water, we find that men are worse off on use of improved sanitation, electricity and clean energy for cooking.

**Table 4.3: Measures of multi-dimensional poverty - decomposed**

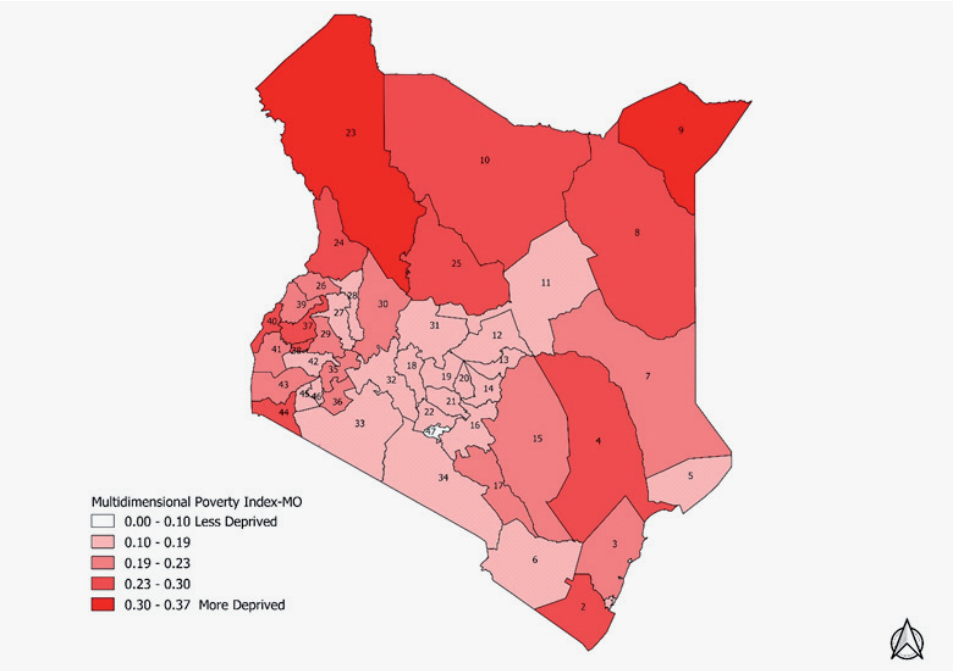
| **Male** | **Female** | **Total** | |
|---|---|---|---|
| Proportion of multi-dimensionally poor* | | | |
| No | 0.3079 | 0.2928 | 0.6007 |
| Yes | 0.2089 | 0.1904 | 0.3993 |
| Total | 0.5168 | 0.4832 | 1.000 |
| Percent contribution | | | |
| H | 0.523 | 0.477 | 1.000 |
| Mo | 0.521 | 0.479 | 1.000 |
| Decomposition by indicator (MO) | | | |
| Economic engagement | 0.120 | 0.074 | 0.098 |
| Monetary poverty | 0.187 | 0.190 | 0.189 |
| Housing material | 0.052 | 0.053 | 0.053 |
| Housing tenure | 0.000 | 0.000 | 0.000 |
| Access to drinking water | 0.087 | 0.085 | 0.086 |
| Access to sanitation | 0.012 | 0.012 | 0.012 |
| Access to electricity | 0.058 | 0.057 | 0.058 |
| Access to energy for cooking | 0.094 | 0.092 | 0.093 |
| Health functioning | 0.136 | 0.181 | 0.158 |
| Adult school achievement | 0.251 | 0.254 | 0.252 |
| Child school attendance | 0.002 | 0.002 | 0.002 |
| Decomposition by dimension (MO) | | | |
| Economic engagement | 0.307 | 0.264 | 0.286 |
| Standard of living | 0.304 | 0.299 | 0.302 |
| Health | 0.136 | 0.181 | 0.158 |
| Education | 0.253 | 0.256 | 0.254 |

*Survey weights used; population =36,370,270

### 4.1.5 Spatial decomposition of MPI by county

We present the spatial decomposition of multi-dimensional poverty by county to build a narrative on regional differences in well-being (Figure 4.2). The results reveal that Nairobi City County has the overall best performance in terms of well-being, with 9.5 per cent of people being multi-dimensionally poor while Turkana County records worst performance of well-being with 37.5 per cent of the people being multi-dimensionally poor. These findings are not surprising, given that Nairobi being the capital city of Kenya has historically recorded better performance in many aspects socio-economic development, such as having the highest county Gross Domestic Product - GDP (KNBS, 2019).

**Figure 4.2: Map of multidimensional poverty by county**




To further understand the spatial distribution of well-being across counties in Kenya, the study further undertook analysis to check for spatial dependence. Spatial dependence can be defined as "the existence of a functional relationship between what happens at one point in space and what happens elsewhere", meaning "the lack of independence" (Anselin, 1988; Zhao et al., 2019). This is indicative of spillover effects of well-being. We check to see if the well-being status of county (A) is affected or affects the well-being of adjacent counties and so on

for all counties. To this end, the Moran's I test for spatial dependence is run, and it reveals existence of spatial dependence on the distribution of multidimensional poverty (Table 4.4). Conversely for discussion, it is found that well-being spills over to nearby counties. The status of poverty in one county spills over or is affected by poverty from nearby counties. Moran's I is an inferential statistic. For interpretation, when the p-value returned by this tool is statistically significant and the z-score is positive, we reject the null hypothesis. It can be concluded that the spatial distribution of high and/or low values of poverty across counties in Kenya is more spatially clustered than would be expected if the underlying spatial processes were random, hence spatial dependence is confirmed. There are clusters of well-off counties and clusters of worse off counties. For further spatial decomposition of multi-dimensional poverty by dimensions for each county, see Annex 3.

**Table 4.4: Moran's-I test of spatial dependence of multi-dimensional poverty**

| Variable | Moran's I | E(I) | SE(I) | Z(I) | p-value |
|---|---|---|---|---|---|
| M0 | 0.22267 | -0.02174 | 0.05566 | 4.39091 | 0.00001 |

Significance P < 0.01

## 4.2 Gendered Access to Water and Energy

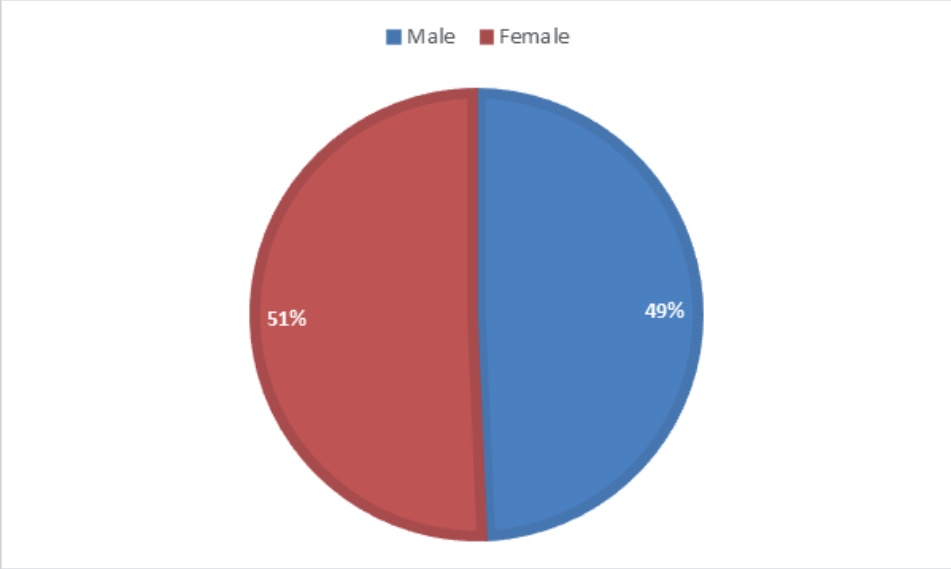
### 4.2.1 Gendered access to water on well-being

Analysis of gendered access to water reveals close similarities in gender roles and time spent by men and women. As discussed in the literature, more women (51%) are responsible for fetching water compared to men (49%), as shown in Figure 4.3(a). Consequently, with regard to time spent access water, women spend marginally longer time in minutes to fetch water and return home (22.85) minutes than men (22.52 minutes), as shown in Figure 4.3(b).

### 4.2.2 Gendered access to energy on well-being

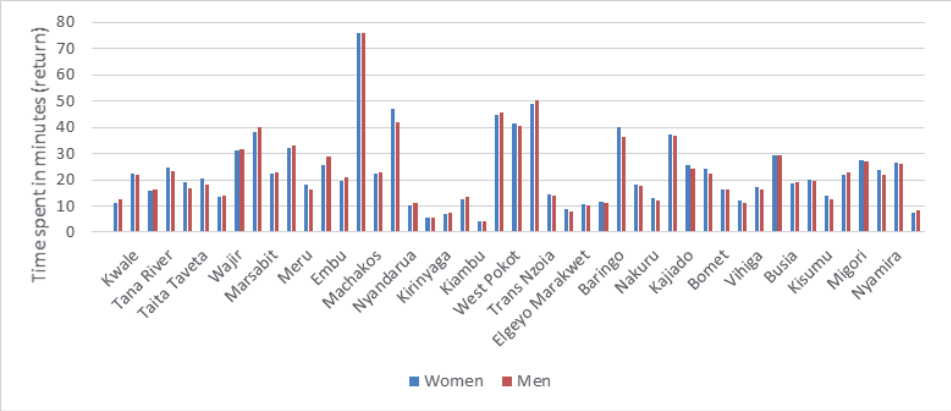
Gendered access to energy on average (aggregate) reveals that women spend disproportionately more time (10.2 minutes) to get (access) energy for the household, while men spend (1.8 minutes). This observation holds for all counties except for Nairobi City County and Mombasa County where men spend more time to get energy for the household. Women in Mandera County spend the highest amount of time getting energy (25 minutes) with Mombasa County having the

**Figure 4.3(a): Who is responsible for fetching water?**




*Source: Author's compilation*

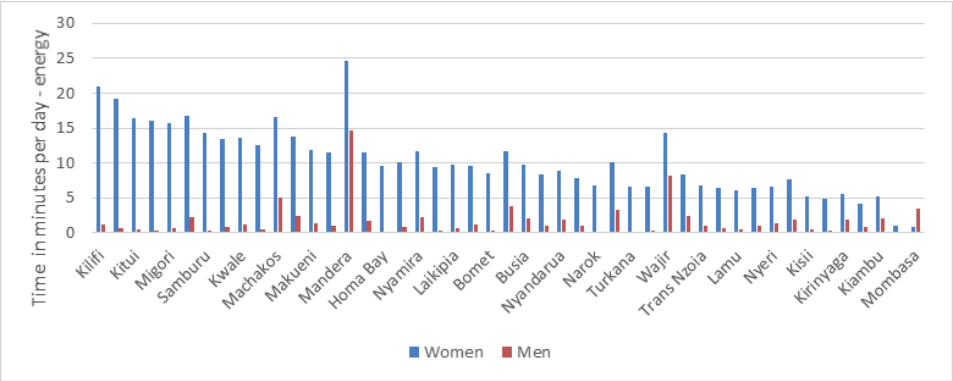
**Figure 4.3(b): Gendered access to water time spent by county**




*Source: Author's compilation*

lowest time spent by women at 0.91 minutes. For men, Mandera County had the highest time spent at 14 minutes and the lowest was Narok County at 0.04 minutes. The largest difference in time spent getting energy between men and women was recorded in Kilifi County at 19.8 minutes difference (Figure 4.4).

**Figure 4.4: Gendered access to energy, time spent by county**




*Source: Authors compilation*

## 4.3 Estimating the Association of Well-being with Gendered Access to Water and Energy

This study sought to examine the relationship between access to water and energy and the well-being of men and women. Of interest was establishing whether there was a difference in the association of access to water and energy and poverty in broader conceptualization, among men and women. The following discussion presents the key findings from the analysis.

### 4.3.1 Gendered access to water on well-being

A logistic regression was estimated to predict the well-being of an individual based on gendered access to water, where well-being is the measure of multi-dimensional poverty coded as (0=No; 1=yes) and gendered access to water is measured in time spent in minutes by men and women to fetch water. Two separate models were tested for men and women. In the women's model, we find that the likelihood of an individual being poor increases with the time that women spend fetching water, with a likelihood of (0.0014), which is significant (P<.01). The findings are similar in the men's model where the time spent by men fetching water increases the probability of an individual being poor with a likelihood of 0.0012 (P<.05). However, women's access to water contributes more to the probability of an individual being poor than men, and is more significant. These findings are expected and supported in literature on access to water and well-being (see Bisunga and Elliott, 2018; Mohapatra and Giri, 2018; Faisal and Kabir, 2005). It is explained that time spent accessing water presents an opportunity cost to, for instance, education and income generation opportunities. The difference in effect

for men and women could be due to their differentiated gender roles in access to water (Moser, 2012). Table 4.5 presents results of the logit model; results of the control variables are included.

**Table 4.5: Logit regression - gendered access to water and well-being**

| | **Women** | **Men** |
|---|---|---|
| Dependent variable: MO-Dummy of multidimensional poverty (0=No; 1=yes) | | |
| Predictors | Marginal effects | Marginal effects |
| Time spent accessing water (minutes) | 0.0014*** | 0.0012** |
| Gender of household head | 0.0234 | -0.0259 |
| Marital status (never married =0) | | |
| Married or living together=1 | 0.0215 | -0.0002 |
| Divorced, widowed, separated=2 | 0.0138 | 0.0231 |
| Polygamous=3 | 0.0331 | 0.0101 |
| Age of household head | -0.0001 | 0.0001 |
| Education of household head (base =0 none) | | |
| Primary=1 | -0.1685*** | -0.1424*** |
| Secondary=2 | -0.4215*** | -0.4834*** |
| Certificate and Diploma=3 | -0.4693*** | -0.5096*** |
| Degree and Post-graduate =4 | -0.4692*** | -0.4895*** |
| Basic=5 | -0.2986* | -0.0062 |
| Wage employment of household head (0=no;1=yes) | 0.1132*** | 0.0852*** |
| Self-employment household head (0=no;1=yes) | -0.1717*** | -0.2152*** |
| Farm based employment household head (0=no;1=yes) | -0.1787*** | -0.2438*** |
| Household size | 0.0311*** | 0.0260*** |
| Household ownership status (base =owns) | | |
| Pays rent/Lease | -0.0718405*** | -0.0596*** |
| No rent with consent | -0.019109 | 0.0165 |
| No rent -squatting | 0.1509572 | 0.0885 |

| | | |
|---|---|---|
| Enumeration area type (base =rural) | | |
| Urban | 0.0191 | -0.0021 |
| Peri-Urban | 0.1869*** | 0.1442*** |

Notes: survey weights used: ***, **, * (p<0.01, p<0.05, p<0.1)

To further aid in the analysis of well-being and access to water, we decomposed the multi-dimensional poverty index into its constituent dimensions, then calculated logistic regression for each dimension as the dependent variable. The results show that men's access to water increases the probability of an individual being poor more than women's access when monetary measures of poverty are applied (i.e. income/expenditure measures), with a likelihood of 0.000836 for men and 0.000825 for women (P<.01). Using economic engagement as the measure of well-being, the results are not statistically significant for women and men's access to water. Regarding the health dimension, the relationship is negative but not significant. The standard of living measure of poverty reveals a positive and significant response to gendered access to water, with a likelihood of 0.0107239 for men (p<.01) and 0.0114809 (p<.01). When education is used as the measure of poverty, the results are not significant.

### 4.3.2 Gendered access to energy on well-being

To assess the implications of gendered access to energy on well-being, a logistic regression was calculated following the approach in section 4.2.1. Two separate models were estimated for men and women. In the women's model, the likelihood of an individual being poor decreases by 0.00024 for every additional time in minutes a woman spends in accessing the energy source. However, women's time spent getting to energy from source was found to be non-significant in influencing the probability of being poor. For the case of the male gender, the time spent by men getting energy from source increases the likelihood of an individual being poor by 0.000329. Like was the case in the women's model, time spent accessing energy too is observed to be non-significant. These results are not expected; the hypothesis being that time spent accessing energy sources would significantly increase the likelihood of being poor and adversely affect well-being. These findings compare with those of Rathi and Vermaak (2018) who found that improved access to energy raises the annual incomes for paid employment, with greater increases for women than men. Parikh et al. (2015) also find contrary results where women's income, education and health outcomes improved with better access (see also Fingleton, 2018 and Mengersen et al., 2011 for further discussion on this). Table 4.6 presents the results of the logit model; results of the control variables are also included.

**Table 4.6: Logit regression gendered access to energy and well-being**

| | **Women model** | **Men model** |
|---|---|---|
| Dependent variable: MO-Dummy of multidimensional poverty (0=no; 1=yes) | | |
| Predictors | Marginal effects | Marginal effects |
| Time spent accessing energy (minutes) | -0.0002 | 0.0003 |
| Gender of household head | 0.0180 | 0.0172 |
| Marital status (never married =0) | | |
| Married or living together=1 | -0.0855*** | -0.0731** |
| Divorced, widowed, separated=2 | -0.0510* | -0.0409 |
| Polygamous=3 | -0.0579* | -0.0519 |
| Age of household head | -0.0001 | 0.0000 |
| Education of household head (base =No education) | | |
| Primary=1 | -0.1439*** | -0.1463*** |
| Secondary=2 | -0.4569*** | -0.4557*** |
| Certificate & Diploma=3 | -0.4781*** | -0.4780*** |
| Degree& Post-graduate =4 | -0.6203*** | -0.6283*** |
| Basic=5 | -0.3733*** | -0.3717** |
| Wage employment of household head(0=no;1=yes) | 0.1406*** | 0.1399*** |
| Self-employment household head (0=no;1=yes) | -0.1774*** | -0.1770*** |
| Farm based employment household head (0=no;1=yes) | -0.2180*** | -0.2181*** |
| Household size | 0.0284*** | 0.0276*** |
| Household ownership status (base =owns) | | |
| Pays rent/Lease | 0.0120 | 0.0153 |
| No rent with consent | -0.0121 | -0.0107 |
| No rent -squatting | 0.1282 | 0.1518 |
| Enumeration area type (base =rural) | | |
| Urban | 0.0772*** | 0.0824*** |
| Peri-Urban | 0.1652*** | 0.1624*** |

Notes: survey weights used: ***, **, * ($p<0.01$, $p<0.05$, $p<0.1$)

To understand how gendered access to energy affects well-being, the multi-dimensional poverty index is decomposed into its constituent dimensions, and a logistic regression for each dimension as the dependent variable estimated for women and men. Using monetary measures of poverty, it can be observed that the time spent by women and men accessing energy decreases the likelihood of an individual being monetarily poor by 0.00025 for women and 0.00102 for men. The results are, however, not significant. Using economic engagement as the measure of well-being, the results show that the likelihood of a person being poor decreases by 0.0014377, with the time spent by women accessing energy, which is significant at 1 per cent. However, in the men's model, the likelihood of being poor also decreases by 0.0013302, although the variable is observed to be insignificant.

Regarding the health dimension, the likelihood of an individual being poor increases by 0.0004036 for the time spent by women accessing energy. However, this is not significant. While the likelihood of being poor increases by a factor of 0.0014115 for the time spent by men accessing energy, this is not strongly significant at ($p<0.1$). Using the standard of living dimension of poverty, the results show that the likelihood of being poor increases by a factor of 0.0011321 for the time spent by women accessing energy, which is significant at 1 per cent level of significance. In the men's model, the likelihood of being poor increases by 0.0000586; however, this is not significant. Turning to education as a measure of poverty, every extra educational level acquired by both men and women is observed to reduce their probability of being poor. For example, women with post-graduate and degree levels of education have a 4.2986 lower likelihood of being poor vis-à-vis their female counterparts who do not have any educational attainment. For the case of men, they have a 4.5015 lower likelihood of being poor for the same level of education. Thus, education plays a significant role in reducing poverty.

# 5. Conclusion and Recommendations

## 5.1 Conclusion

This paper sought to measure gender differences in access to water and energy and examine the relationship with well-being of women and men. For well-being, a multi-dimensional poverty index was computed with dimensions covering standard of living, economic engagement/money poverty, education and health. A logistic regression was calculated to predict the well-being of an individual based on gendered access to water, where well-being was the measure of multidimensional poverty, and gendered access to water was measured in time spent in minutes by men and women to fetch water. Two separate models were tested for men and women. The descriptive statistics revealed that more women are responsible for fetching water compared to men. Consequently, with regard to time spent access water, women spend marginally longer time in minutes to fetch water and return home than men, but the argument here is that the burden is more on women than men due to the gender roles and gender division of labour in the households. The results show that women's well-being is disproportionately adversely affected by lack of access to water than men. The paper reveals that there are gender inequalities in access to water, and these inequalities adversely affect the well-being of individuals. The inequalities have been explained by the different gender roles of men and women.

Regarding access to energy, a similar approach was followed to that of water. In the women's and men's model, the time spent getting energy from source was found to be non-significant in influencing the probability of being multi-dimensionally poor. Contrary to expectations, time spent to get energy by men and women does not explain the likelihood of being multi-dimensionally poor. This is despite the descriptive data on gender roles in getting energy, where gendered access to energy on average reveals that women spend disproportionately more time (10.2 minutes) to get (access) energy for the household, while men spend (1.8 minutes). However, this difference did not explain well-being. Further, the results in the energy analysis were contrary to literature, where improved access to energy was seen to improve well-being.

## 5.2 Recommendations

Based on the foregoing analysis, the following policy recommendations could be considered.

- Overall, there is need to prioritize investment in interventions that will reduce the time spent by women in accessing water. This has been shown

to negatively affect well-being and is adverse to shared prosperity. Gender inequality prevails with regard to access to water. Programmes and projects designed to enhance access to improved water sources for households would ultimately improve well-being. The key policy actors in this are the County Governments, given their constitutionally defined mandate in water service delivery.

- There is need for gender targeting in interventions, programmes and projects geared towards enhancing access to water and energy. The gender targeting could be informed by a situational analysis of the gender roles in the prevailing target community and identification of household decision-making structures. Through this analysis, the interventions can be designed to ensure that the needs of men and women are addressed for realization of benefits. The Water Sector Trust Fund through its mandate can increase focus in ensuring access to water in underserved and marginalized rural and urban areas, with emphasis or priority on women-headed households.
- Further research is required on gendered access to energy and its effects on well-being, possibly using ethnographic technics and focusing on different income groups and rural versus urban areas.

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# Appendix

## Appendix 1: Description of indicators

| Dimension | Indicator | Deprivation indicators (deprived if ...) / cut-offs | Reference |
|---|---|---|---|
| Health | Health functioning | (Children and Adolescents) has suffered from a chronic disease or eruptive disease or diarrhea or several diseases in the past four weeks. | |
| (Adults and Elderly) has suffered from a chronic disease or several diseases in the past four weeks | Espinoza and Klasen (2018); Rippin (2016) | | |
| | Body Mass Index | At least one adult member of the household with BMI less than 18.5 $kg/m^2$ | Yu (2013) |
| | Child mortality | Any child has died in the family | Alkire et al. (2017); UNDP (2018) |
| | Nutrition | Any adult or child for whom there is nutritional information is malnourished | Alkire et al. (2017); UNDP (2018) |

| | | | |
|---|---|---|---|
| Education | School achievement | Children) is not attending nursery school or pre-school or primary school and the head of the household has not completed lower secondary school | |
| (Adolescents) is not on track to complete lower secondary school by 17 years old | | | |
| (Adults) has not completed lower secondary school | | | |
| (Elderly) has not completed lower secondary school | Espinoza and Klasen (2018); UNDP (2018); Rippin (2016); Yu (2013) | | |
| Years of schooling | No household member has completed five years of schooling | | |
| | Child school attendance | Any school-aged child is not attending school up to the age at which they would complete class 8 | Alkire et al. (2017); UNDP (2018) |
| Economic engagement | Employment status | (Adult) is unemployed; employed without a pay | |
| A discouraged worker or hidden unemployed; an unpaid domestic worker (he or she is unemployed but is not looking for a job because has to take care of his/her children and/or a relative (s) and/or has to do domestic work) | Espinoza and Klasen (2018) | | |
| | Income | Monetary measure - per capita income of household; Deprived if income is below poverty line threshold for urban and rural | Rippin (2016); Yu (2013) |

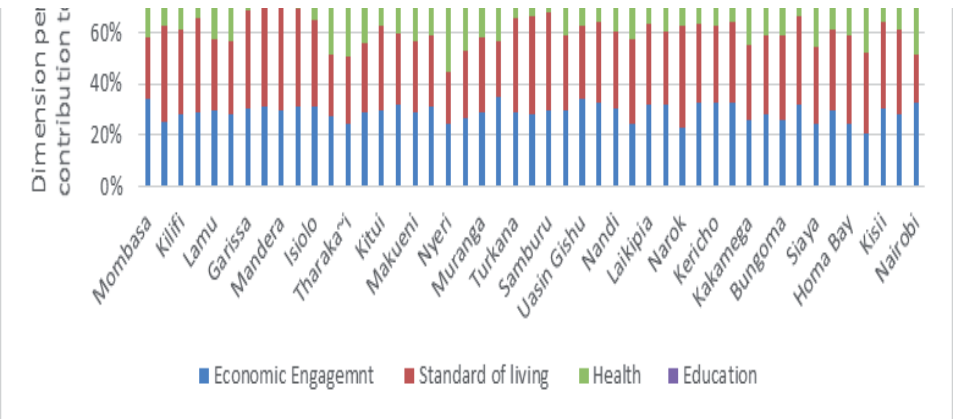
| | | | |
|---|---|---|---|
| Standard of living | Housing | Living in a house with dirt floor and/ or precarious roof (waste, straw, palm and similar, other precarious material) and/or precarious wall materials (waste, cardboard, tin, cane, palm, straw, other precarious | |
| Material) | Alkire et al. (2017); Espinoza and Klasen (2018); UNDP (2018); Rippin (2016) | | |
| | Access to clean water | No access to tap water in house or in yard | Yu (2013); Espinoza and Klasen (2018) |
| | Access to electricity | Not using electricity as the main source of lighting | Yu (2013); Espinoza and Klasen (2018) |
| | Access to improved cooking fuel | Using wood, stick/ straw, charcoal, etc as main fuels for cooking fuel cooking | Yu (2013); Espinoza and Klasen (2018) |
| | Access to improved sanitation facilities | No access to toilet facilities, no access to private sanitation facilities rest-room, or using open earth pit as toilet; Not using an improved type of sanitation facility that is not shared with other households and from which the excreta produced are either safely treated in situ, or transported and treated off-site | Yu (2013); Espinoza and Klasen (2018); SDG target 6.2 |
| | Housing tenure | Living in an illegally occupied house or in a ceded or borrowed house | Espinoza and Klasen (2018), UNDP (2018) |
| | Assets ownership | The household does not own more than one radio, TV, telephone, bike, motorbike, or refrigerator and does not own a car or truck | Alkire et al. (2017); Espinoza and Klasen (2018), UNDP (2018) |

| | | | |
|---|---|---|---|
| Social security/ protection | Medical insurance | No household member has access to any medical insurance; elderly person is identified as deprived in social protection if he or she has no access to any form of income, such as for instance, pension, retirement income, and work income | Yu (2013); Espinoza and Klasen (2018) |

## Annex 2: Decomposition of MPI bt gender of household head

| **Indice** | **Male** | **Female** | **Total** |
|---|---|---|---|
| Absiolute | | | |
| H | 0.398 | 0.389 | 0.395 |
| Mo | 0.175 | 0.176 | 0.175 |
| Pop Share | 0.695 | 0.305 | 1 |
| Per cent contribution | | | |
| H | 0.7 | 0.3 | 1 |
| Mo | 0.695 | 0.305 | 1 |
| Decomposition by indicator (MO) | | | |
| EconEng | 0.166 | 0.106 | 0.147 |
| MoneyPovtR | 0.153 | 0.139 | 0.149 |
| HseMat | 0.048 | 0.043 | 0.047 |
| HseTen | 0.000 | 0.000 | 0.000 |
| AccesWaterDr | 0.082 | 0.08 | 0.082 |
| AccesSant | 0.011 | 0.009 | 0.01 |
| AccesEleclit | 0.058 | 0.056 | 0.057 |
| AccesEnerCk | 0.092 | 0.088 | 0.091 |
| HealthFnct | 0.161 | 0.249 | 0.188 |
| AdultSchAchv | 0.229 | 0.23 | 0.229 |
| ChildSchAttnd | 0.000 | 0.000 | 0.000 |
| Decomposition by dimension (MO) | | | |
| Economic engagement | 0.319 | 0.245 | 0.296 |
| Standard of living | 0.291 | 0.276 | 0.286 |
| Health | 0.161 | 0.249 | 0.188 |
| Education | 0.229 | 0.23 | 0.229 |

## Appendix 3: Spatial decomposition of MO by dimension for each county



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