

ANALYSIS OF ELECTRICITY ACCESS IN WESTERN CAPE

A Research Project Report
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by

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ABSTRACT

In the past there have been many studies that have focused on access to electricity in South Africa. This study is different because it focuses on household access to electricity in Western Cape. This paper presents an analysis of household access to electricity in Western Cape using community survey 2016 from statistics South Africa. The study employs statistical techniques such as descriptive statistics to explore characteristics of the data and the chi square test is used to investigate the relationship between socio-economic factors and household access to electricity. This paper investigates the impact of gender of household head, population group of household head, main type of dwelling, geographical type, metropolitan and district on household access to electricity in Western Cape. The results of this study in this study shows that there are significant differences between socio economic factors and household access to electricity which means socio economic factors do affect household access to electricity

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LIST OF ABBREVIATIONS

1. Stats SA- Statistics South Africa
2. CS- Community survey

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CHAPTER 1: INTRODUCTION

1.1 Background

The provision of electricity plays a crucial role in addressing basic social need, driving economic growth, and fueling human development (Sarkodie & Adams,2020). Studies have highlighted the significance of electricity access in reducing poverty and enhancing livelihoods, emphasizing its impact on various aspects of life, including education, healthcare, and economic productivity (Asghar et al.,2022).

Research have shown that income inequality and socio-economic factors can significantly affect electricity access and consumption behavior, with differences observed across different population groups and geographical locations (Sarkodie & Adams,2020; Ye et al.,2018). Addressing affordability challenges and ensuring equitable access to electricity are critical for achieving sustainable development goals and fostering inclusive growth (Asghar et al,2022; Qeqe et al., 2022). Even with efforts to expand electricity access, challenges persist, particularly in rural areas and low-income households. high electricity prices and limited affordability poses barriers in access and contribute to household welfare challenges which signaling a need for policy interventions to mitigate energy poverty and promote affordable access to basic services (Sievert & Steibuks,2020; Qeqe et al.,2022). This research aims to investigate the extent to which socio-economic effect on access to electricity in Western Cape province in South Africa.

1.2 Research Problem

Despite efforts that have been made in addressing accessing electricity in Western Cape. Households from disadvantaged areas experience more difficulties in accessing electricity. These difficulties may cause them to fall behind in terms of development objectives.

1.3 Research Questions

How do socio-economic factors affect household access to electricity in the Western Cape province?

1.4 Research Objectives

To analyze the access of households to electricity in the Western Cape.

- To investigate how socio-economic factors affect household access to electricity in the Western Cape province.

1.5 Research Hypotheses

The impact of socio-economic factors on household access to electricity is significantly different in Western Cape.

1.6 Significance of Research

This study it provides insights into socio economic factors that affect access to electricity and could in future assist electricity providers in resource allocation that will ensure that the needs of electricity in western cape households are met, which will lead to improved quality life for all households that are experiencing difficulties in accessing electricity.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of past papers on the topic of access to electricity, there are many studies that have investigated access to electricity at national such as (Sarkodie & Adams, 2020; Ye et al., 2018; Geqe et al., 2022; Asghar et al., 2022; Sievert & Steinbuks, 2020). The mentioned papers have done the study at national level, unlike my study which focuses on provincial level (Western Cape).

2.2 Empirical Literature review

Ye et al. (2018) investigated the determinant of electricity usage in South African households. They used South African income and expenditure survey secondary dataset from Statistics South Africa (Stats SA) and the National Energy Regulator of South Africa (NERSA) tariff database. To analyze home electricity consumption expense, their study used a two-part model (2PM) with the first part using a probit model to estimate the probability of positive electricity spending while considering the factors impacting home consumption behavior and the second part focusing on least square regression (OLS) to analyze the expenses for the subgroup of residences that use electricity. Their findings revealed urban areas consume more electricity compared to rural areas and when electricity prices increase households tend to reduce electricity consumption.

Geqe et al. (2022) evaluated the relationship between electricity prices and household welfare in South Africa, using the secondary dataset from the Department of Energy's annual energy statistics publication Eskom annual reports, Stats SA's income and expenditure surveys using the linear expenditure demand system framework. Their findings revealed that when spend more on electricity they spend less on food and contrary to Ye et al. (2018) electricity prices had no significant effect on the amount of electricity the household used. The concluded that affordability remains a challenge and an effect on household welfare.

Sievert and Steinbuks (2020) In their study examined the willingness to pay of poor rural households for different types of electricity access technologies and how willingness varied across different income levels. The regression analysis confirmed the high WTP with increased income level households prioritize electricity access and are willing to allocate ten percent of their monthly income for it however, households from extreme poverty have a very low willingness to pay. Their study concluded that off grid solar technologies could be a feasible solution to address the challenge faced by households in areas of extreme poverty.

Sarkodie and Adams (2020) investigated the connection between access to electricity and income inequality in South Africa. They examined the effect of electricity access on income inequality, using four data series that included access to electricity, GDP per capita, Control of Corruption (used as a proxy for measuring corruption) adopted from World Bank database and GINI disposable. Utilizing Bayesian and non-linear autoregressive distributive lag (NARDL) estimation techniques. Their findings revealed that income inequality had no negative effect on electricity access and similar to Sievert and Steinbuks (2020) found that as income level increase access to electricity get priority and tends to increase.

The study by Asghar et al. (2020) examined the impact of electricity access on poverty reduction in developing countries. Employing empirical method based on World Bank categorization and utilizing data from 1990 to 2020 from the World Development Indicator (WDI) database 2022, the study explored the relationship between access to electricity and poverty using Autoregressive Distributed Lag (ARDL). Their findings revealed that access to electricity significantly contribute to poverty alleviation and in conclusion this study suggested making electricity affordable to improve electricity access and thereof reduce poverty.

CHAPTER 3: METHODOLOGY

3.1 Data Source

Statistics South Africa (Stats SA) conducts the Community Survey every after ten years in between Census. This study used community survey 2016. The study is a cross-sectional study because it used cross-sectional data.

3.2 Data Description

The following variables used in this study formulate results and draw conclusions.

Table 3.1: Variables used in the study.

| Variable Names | Type |
|--|-------------|
| Gender of household head | Categorical |
| Population group of household head | Categorical |
| Main dwelling type | Categorical |
| Geographical type | Categorical |
| District and municipality municipalities | Categorical |
| Household electricity access | Categorical |

3.3 Data Preparation

The data was cleaned, and new variables were created by merging old categories into new categories therefore giving the data new values.

- Creating variable household electricity access (Access to electricity by Eskom, Access to electricity by other sources, No access to electricity).
- All other responses such as “unspecified” were classified as missing values.

3.4 Data Analysis

Descriptive statistics

To explore the characteristics of the data.

Inferential statistics (chi-square test)

used to investigate the relationship between household access to electricity and socio-economic factors.

chi-square test:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where:

χ^2 is the chi square value

O_i are observed values

E_i are expected values

The p-value helps determine if there are significant differences between socio-economic factors and access to electricity.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

Chapter 4 presents the findings made in this study through the application of statistical techniques detailed in chapter 3. All results presented in this study are from Stats SA CS datasets of the year 2016. The study presents finding through tables and data visualizations. The statistical analysis explores characteristics of the data. Chi square is used to investigate the relationship of access to electricity and socio-economic factors.

4.2 Descriptive Statistics

Table 4.2: Demographics

| | | Frequency | Percent |
|--|---|-----------|---------|
| Sex of household head | Male | 1198208 | 62.0 |
| | Female | 735669 | 38.0 |
| Population group of household head | Black African | 793335 | 41.0 |
| | Coloured | 730075 | 37.8 |
| | Indian/Asian | 14370 | 0.7 |
| | White | 396096 | 20.5 |
| Household access to electricity | Access to electricity provided by Eskom | 1866531 | 96.5 |
| | Access to electricity by other Source | 16441 | 0.9 |
| | No access to electricity | 50905 | 2.6 |
| Geographical type | Urban areas | 1843782 | 95.3 |
| | Farm areas | 90094 | 4.7 |
| District and metropolitan municipality | City of Cape Town Metropolitan | 1264849 | 65.4 |
| | West Coast | 129862 | 6.7 |
| | Cape Winelands | 236006 | 12.2 |
| | Overberg | 91835 | 4.7 |
| | Garden Route | 189345 | 9.8 |
| | Central Karoo | 21980 | 1.1 |
| | Formal | 1593891 | 82.4 |

| | | | |
|---|-------------|---------|------|
| Main dwelling that the household currently lives in | Informal | 330324 | 17.1 |
| | Traditional | 9401 | 0.5 |
| Total | | 1933876 | 100 |

The results show that in 2016 the percentage of households headed by male was 62% compared to 38% which were headed by females. Many of households in Western Cape were headed by black/African at 41%, followed by 37.8% households headed by Coloured. The percentage of households that were located in urban areas was 95.3% compared to 3.7% of households that were located in farm areas. The percentage of households that were residing in formal housing was 82.4% while 17.1% were residing in informal housing and 0.5% were in traditional housing. The results also show that in 2016 the percentage of Western Cape households that had access to electricity provided by Eskom was 96.6%, while 0.9% had access to electricity provided by other sources, and 2.6% had no access to electricity indicating that even though many households had access to electricity largely from Eskom there remained a small percentage of households who have no access to electricity.

4.3 Household access to electricity via socioeconomic factors

Table 4.3: Chi square test

| | | Household access to electricity | | | P-value |
|---|--------------------------------|---------------------------------|--------------|-----------|---------|
| | | Eskom | Other Source | No access | |
| Sex of household head | Male | n | 1153323 | 11378 | 33507 |
| | | % | 96.3% | 0.9% | 2.8% |
| | Female | n | 713208 | 5063 | 17398 |
| | | % | 96.9% | 0.7% | 2.4% |
| Population group of household head | Black African | n | 746737 | 4683 | 41914 |
| | | % | 94.1% | 0.6% | 5.3% |
| | Coloured | n | 713900 | 7428 | 8747 |
| | | % | 97.8% | 1.0% | 1.2% |
| | Indian/Asian | n | 14370 | 0 | 0 |
| | | % | 100.0% | 0.0% | 0.0% |
| | White | n | 391523 | 4330 | 243 |
| | | % | 98.8% | 1.1% | 0.1% |
| Main dwelling that the household currently lives in | Formal | n | 1575375 | 11652 | 6863 |
| | | % | 98.8% | 0.7% | 0.4% |
| | Informal | n | 282586 | 4353 | 43385 |
| | | % | 85.5% | 1.3% | 13.1% |
| | Traditional | n | 8308 | 436 | 657 |
| | | % | 88.4% | 4.6% | 7.0% |
| Geographical type | Urban areas | n | 1787188 | 10085 | 46509 |
| | | % | 96.9% | 0.5% | 2.5% |
| | Farm areas | n | 79343 | 6356 | 4396 |
| | | % | 88.1% | 7.1% | 4.9% |
| District and metropolitan municipality | City of Cape Town Metropolitan | n | 1236000 | 5857 | 22992 |
| | | % | 97.7% | 0.5% | 1.8% |
| | West Coast | n | 122205 | 1071 | 6585 |
| | | % | 94.1% | 0.8% | 5.1% |
| | Cape Winelands | n | 218483 | 5833 | 11690 |
| | | % | 92.6% | 2.5% | 5.0% |
| | Overberg | n | 86890 | 916 | 4029 |
| | | % | 94.6% | 1.0% | 4.4% |
| | Garden Route | n | 181973 | 2210 | 5162 |
| | | % | 96.1% | 1.2% | 2.7% |

| | | | | | | |
|--|---------------|---|-------|------|------|------|
| | Central Karoo | n | 20979 | 554 | 447 | 0.00 |
| | | % | 95.4% | 2.5% | 2.0% | |

Figure 4.3.1: Western Cape household electricity access via gender

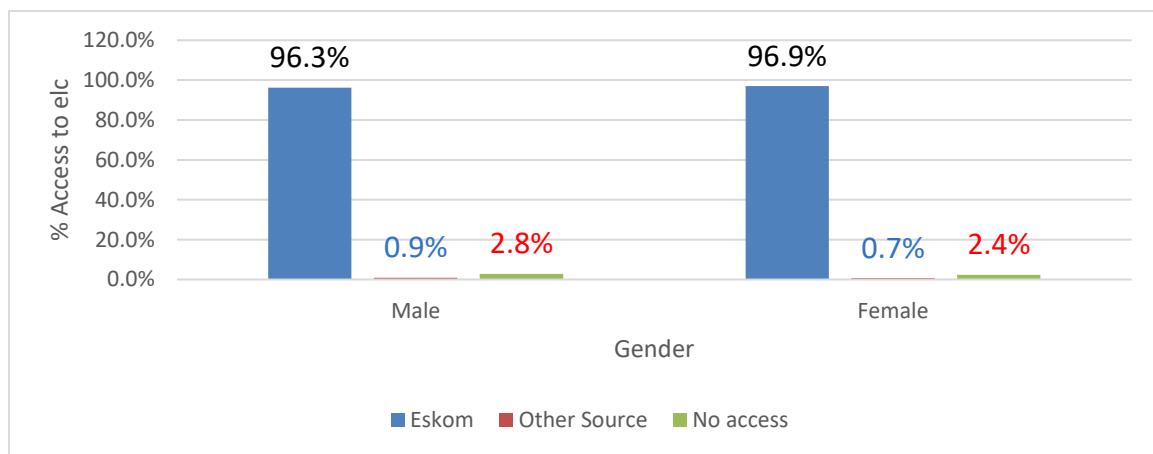


Table 4.3 and figure 4.3.1 shows that in 2016, 2.8% of households headed by males did not have access to electricity compared to 2.4% of households headed by females, only 0.9%. The chi-square test p-value was less than 0.05, there were statistically significant differences between access to electricity and gender.

Figure 4.3.2: Western Cape household electricity access via Population group

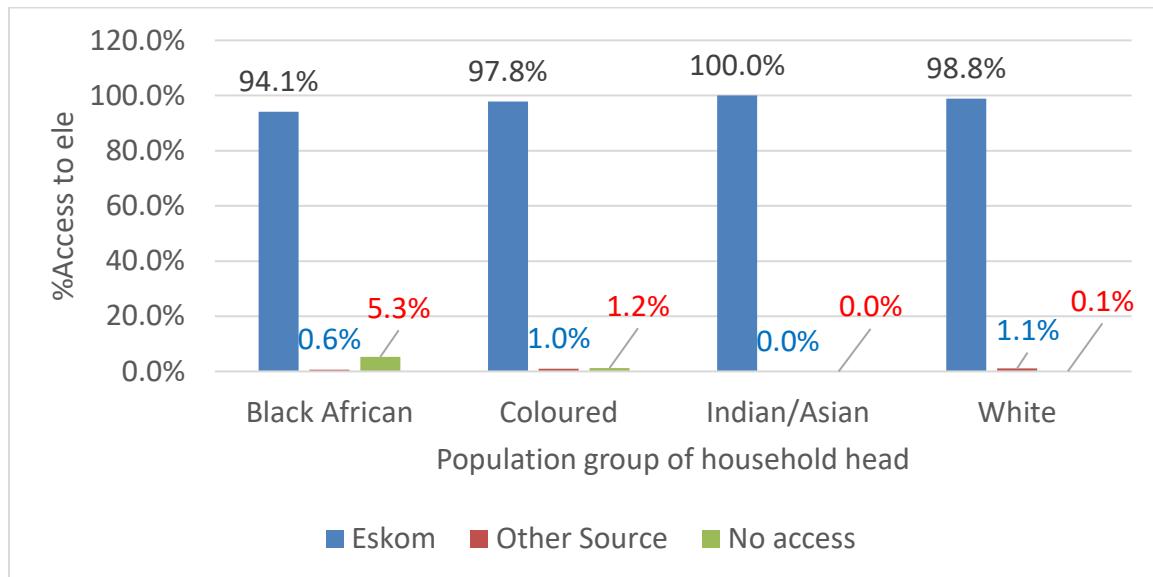


Table 4.3 and figure 4.3.2 shows that in 2016, 5.3% of Black African-headed households had no access to electricity followed by 1.2% of coloured-headed households compared to only 0.1% of households headed by white. All households headed by Indian/Asian have access to electricity provided by Eskom. The chi-square test p-value was less than 0.05, so there were statistical differences between the population group and access to electricity.

Figure 4.3.3: Western Cape household electricity access via main type of dwelling

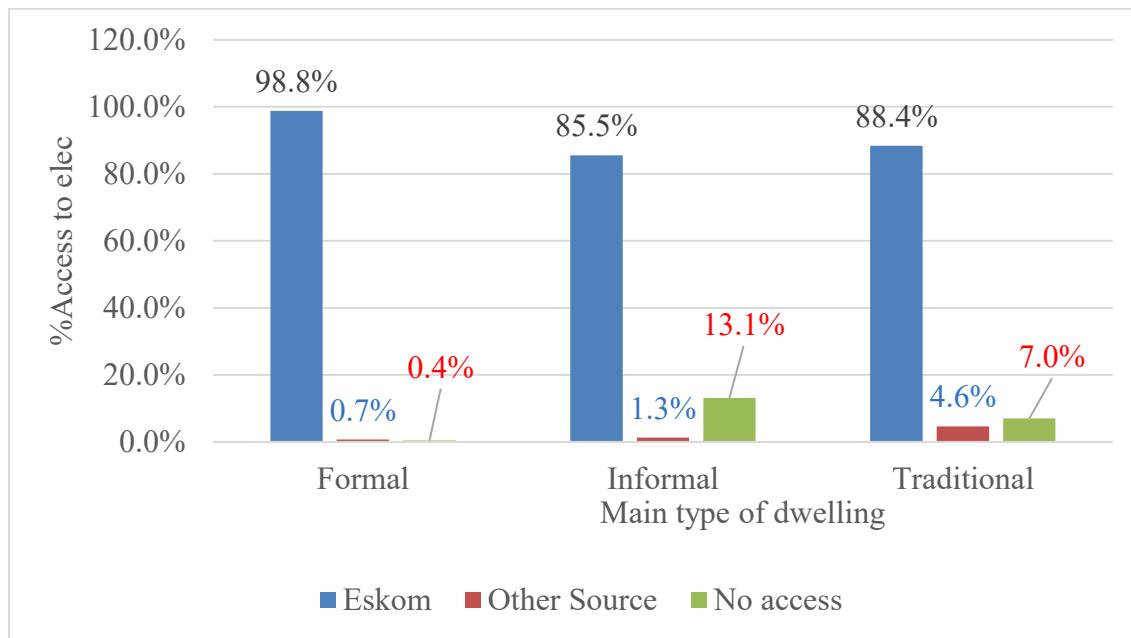


Table 4.3 and figure 4.3.3 shows that in 2016, 13.1% of households who were living informal dwellings had no access to electricity followed by 7% of households who were living in traditional dwellings compare to 0.4% of households who were living in formal dwellings and had no access to electricity. The p-value was less than 0.05, there were statistically significant differences between dwelling types and access to electricity.

Figure 4.3.4: Western Cape household electricity access via geographical type

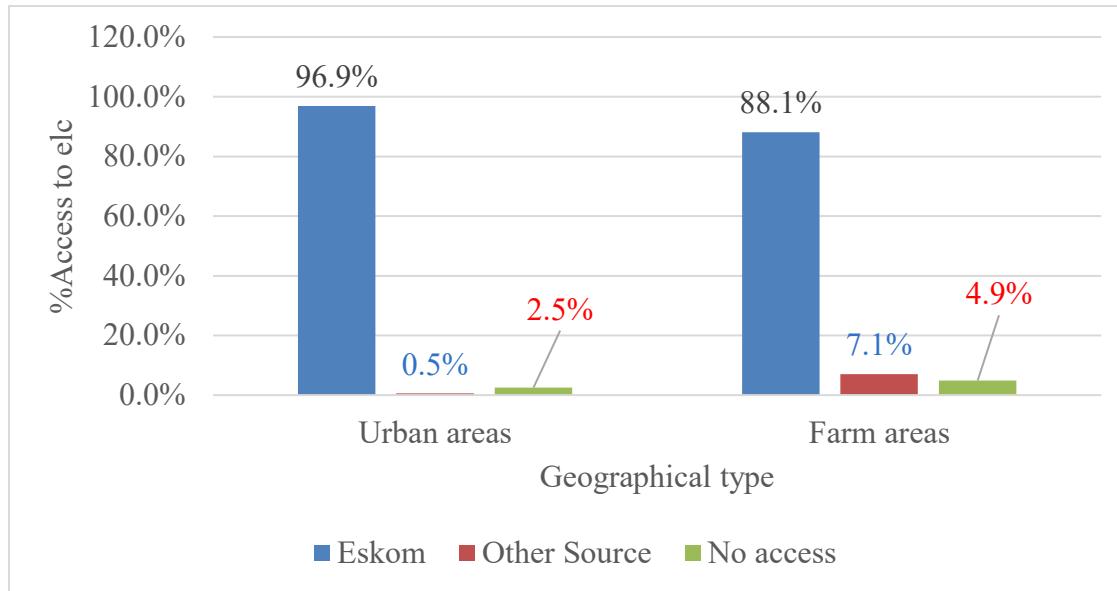


Table 4.3 and figure 4.3.4 show that in 2016, 4.9% of households located in farm areas had no access to electricity compared to 2.5% of households located in urban areas who did not have access to electricity. the chi square test p value was 0.05, there were statistically significant differences between access to geographical type and access to electricity.

Figure 4.3.5: Western Cape household electricity access via metropolitan and districts

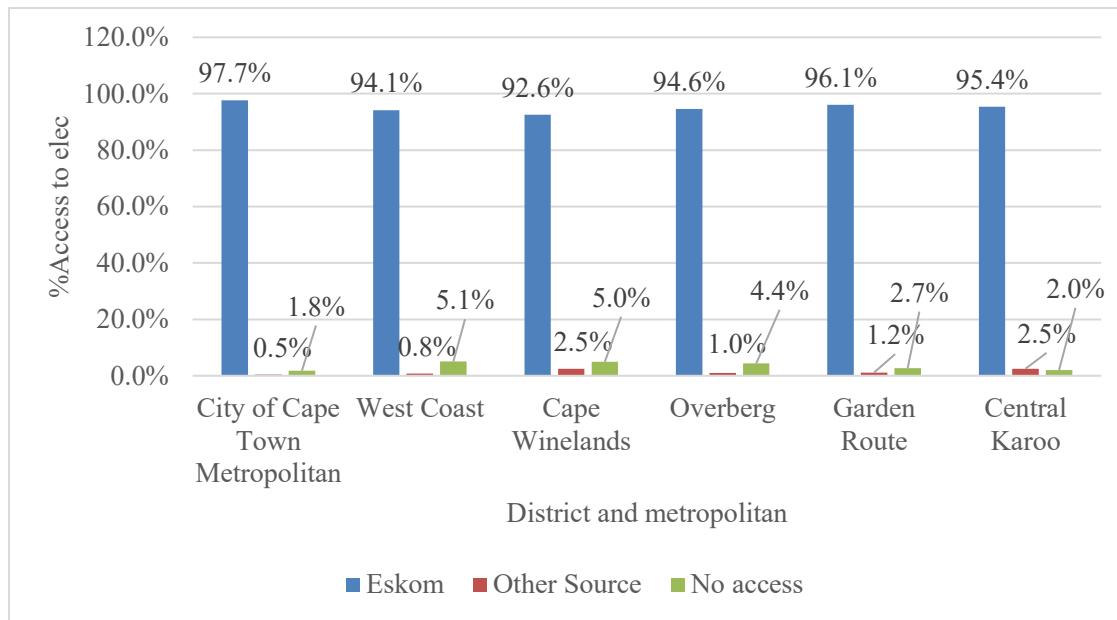


Table 4.3 and figure 4.3.5 shows that in 2016, 5.1% of households located in the West Coast district and 5% of households located in the Cape Winelands district had the highest percentages of households that did not have access to electricity followed by 4.4% of households located in Overberg compared to the lowest 1.8% of households located in city of Cape Town metropolitan who did not have access to electricity. The chi-square test was less than 0.05, there were statistically significant differences between district/metropolitan and access to electricity.

CHAPTER 5: CONCLUSION

despite great efforts that have been made to address household access to electricity in Western Cape province, the results of this study show that there are disparities across different households in access to electricity. In 2016 Black/African headed households had the highest percentage of households that did not have access to electricity at 5.3% followed by coloured headed households at 1.2% and 13.1% of households that are living in informal followed 7%Traditional dwellings. Households that were headed by Indian and Asian, located in urban areas and live in formal dwellings have lower percentage of households that do not have access to electricity

The impact of socio-economic factors on household access to electricity is significantly different in Western Cape with evidence at a 5% level of significance, which means socioeconomic factors do affect household access to electricity. There is need for targeted interventions measures that will address these disparities in order to ensure equitable household access to electricity and improved standard of living for all in Western Cape.

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