BOTSWANA POPULATION & HOUSING CENSUS 2022 : ANALYTICAL REPORT

VOLUME 2

Household Characteristics, Economic Activity

STATISTICS BOTSWANA

UNFPA

Republic of Botswana

PALO BATHO • CENSUS 2021 • STATISTICS BOTSWANA •

Mpala, Ke Botlhokwa

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Contact:

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Mpala, Ke Botlhokwa

PREFACE

The 2022 Population and Housing Census (PHC) represents a significant milestone in the conduct of Botswana's decennial Population and Housing Censuses. Its undertaking provides a comprehensive snapshot of the nation's demographic, social, and economic landscape. The data collected through this census offers invaluable insights into the country's evolving population dynamics, household characteristics, and socio-economic trends.

These thematic volume follows a series of reports earmarked as products of the 2022 Population and housing Census. Due to the rich resource of the census data, there is need to further delve into deeper analysis. This report presents a detailed thematic analysis of the 2022 PHC data. It delves into a range of critical areas, including population distribution and growth, household composition, education, employment, health, transport, agriculture and housing. By examining these key themes, the report aims to inform policymakers, researchers, and other stakeholders in their efforts to address national development challenges and opportunities. The analysis presented in this report is based on rigorous data processing and statistical techniques. Every effort has been made to ensure the accuracy and reliability of the findings. However, it is important to note that data collection and analysis processes are subject to potential limitations, such as sampling error, non-response bias, and data quality issues.

The analysis of the 2022 PHC has been organized into six thematic volumes:

Volume 1: Demographic and Social Characteristics, Registration, Youth and Elderly, Education
Volume 2: Household Characteristics, Economic Activity
Volume 3: Gender, Disability, Nuptiality, Migration, and Urbanization
Volume 4: Transport and ICT, Agriculture and Land Ownership
Volume 5: Fertility, Mortality and Household Energy Use
Volume 6: Employment (Occupation and Industry)

I express my sincere gratitude to the dedicated team of professionals/analysts who contributed to the successful analysis implementation of the 2022 PHC. Their hard work and commitment have made this comprehensive analysis possible. We also acknowledge the support of our development partners, particularly the United Nations Population Fund (UNFPA) and United Nations Development Fund (UNDP), whose technical assistance was instrumental in the conduct of the census.

We trust that these thematic volumes report will serve as a valuable resource for understanding Botswana's demographic and socio-economic landscape.

Dr. Lucky Mokgatlhe
Acting Statistician General
July 2025

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SUMMARY STATISTICS

Demographic and Socio-Economic Indicators	2022	2011
Total Population	**2,359,609**	**2,024,904**
Number of Households	**684,844**	**550,926**
Average household size	3.3	3.7
*Average size of male-headed households	3.0	3.4
*Average size of female-headed households	3.7	4.0
Population Density	4.1	3.5

ECONOMIC ACTIVITY

CONTRIBUTION OF TIMBER AND NON-TIMBER FOREST PRODUCTS TO INCOME AND EMPLOYMENT GENERATION

Keneilwe Kgosikoma,
Witness Mojeremane and
Moatlhodi Kgosimore

EXECUTIVE SUMMARY

Timber and non-timber forest products play a vital role in supporting the livelihoods of people living in urban and rural areas of Botswana. This paper utilizes the 2022 National Population and Housing census (NPHC) data to assess the contribution of natural resources to income generation and employment generation. Statistical analysis was carried out using STATA 18. Results were summarized in the form of tables and graphs, using descriptive statistics. The study considers the variables: source of cash income, gender, age and dwellings.

The results indicate that there is potential for utilization of timber and non-timber forest products through selling of veld products, tree planting and timber harvesting, for income and employment generation, particularly in rural areas. There is need to develop value chains in the veld products market and market orientate vulnerable such as women and youth, especially in rural areas. The study addresses the national aspirations enshrined in Vision 2036, regional frameworks such as Agenda 2063 as well as Sustainable Development Goals (SDGs).

There is need to promote the development of the veld products value chain for income and employment generation. Emphasis should be on women, particularly in rural areas to address the gender disparity between males and females. This will ensure sustainable human social development and environment in line with Vision 2036, and attainment of SDG 1, 2 and 5 of no poverty, zero hunger and gender equality.

INTRODUCTION

Timber and non-timber forest resources play a vital role in supporting the livelihoods of people in both the urban and rural areas. Botswana is endowed with a broad range of natural resources which includes flora, fuana and minerals. These natural resources play a vital role in supporting the livelihoods of people in both the urban, peri-urban and rural areas. It has been estimated that over 65% of Africa's billion people are dependent on natural resources that are harvested from the wild (Koziell and Saunders, 2001; Lawes et al. 2004) and water sources for both subsistence uses and cash incomes (Timko et al. 2010). Soil and water are fundamental resources to agricultural activities, and a key part of the economy in many developing countries including Botswana. They act as an environmental host of extensive areas of forests, woodlands, grasslands, and water where most natural resources that include firewood, timber mopane worms, thatching grass, edible indigenous vegetables and fruits, medicinal plants, fish, and mushrooms are harvested. Although, Botswana has one of the highest per capita levels of income in Africa, employment and food security remain a challenge at both household and national levels. Therefore, natural resources provide food, income, building and waving materials, fuel, medicine, social networks, and ecological services to both rural, peri-urban and urban dwellers (Shackleton et al. 2000). Natural resources such as firewood, mopane worms, thatching grass, fruits, medicinal plants, honey and fish are harvested for subsistence use or sold in both rural, peri-urban and urban areas to provide households with income. Globally, cash and non-cash income from natural resources are estimated to range up to 60% 0f total household income (Angelsen et al. 2014; L'Roe et al. 2014).

People from all walks of life in Botswana harvest and use natural resources for several purposes such as to satisfy the households' subsistence and consumption needs. Natural resources provide alternative income during times of crises when there are shortages from regular sources, such as during crop failure. For several decades natural resources in Botswana and elsewhere have been traded in local markets and thus contribute to employment in the informal sector. Despite their importance, their contribution to the livelihoods of households in both the rural and urban set-up in Botswana has been ignored.

PURPOSE OF THE STUDY

The purpose of this study is to provide baseline data that addresses Target 12.2 under Goal 12, Ensure sustainable consumption and production patterns, for the country to achieve the sustainable management and efficient use of natural resources by 2030.

Significance of the Study

The results of the study will give policy direction on the sustainable utilization of the country's rich natural resources endowment. Sustainable consumption and production patterns will ensure that economic growth is coupled with environmental sustainability, thus protecting the countries diverse environmental resources, biodiversity, and ecosystems for continued provision of both direct and indirect services from utilization of natural resources. As well as ensuring that the natural resources will be availed to future generations in the same quality and quantities, sustainable consumption and production patterns will provide alternatives to the attainment of SDG 1, 2 and 5 of no poverty, zero hunger and gender equality, through utilization of natural resources for employment and income generation.

Objectives of the Study

The main objective of the study was to assess the contribution of timber and non-timber forest resources to household income and employment. The specific objectives were to:

- **Determine the proportion of the population actively involved in the use of timber and non-timber forest resources for livelihoods.**
- **Document the type of timber and non-timber forest resources activities that households are engaged in.**
- **Determine levels of gender and age participation in timber and non-timber resources utilization and,**
- **Evaluate the proportion of households earning cash income from timber and non-timber forest resources by spatial distribution.**

Definition of Main Concepts

Circular economy model: a model where materials and products are shared, leased, repaired, and reused for as long as possible.

Resources: the raw materials supplied by the earth and its processes.

Timber and non-timber forest products: renewable natural resources, such firewood, medicines, fish, mopane woods, indigenous vegetables.

Regulatory framework: legal mechanisms that exist on national, regional and international levels and can be mandatory and coercive (national laws such as the Forest Act and regulations) or voluntary.

Literature Review

Natural resources such as rivers, forests and many other plays a crucial role for humans and the environment (Butler and Oluoch, 2006; Dalu et al. 2021; Do et al. 2022) because they serve as the foundation for our daily lives and all economic activity (Singh 2024). Natural resources can generate and sustain growth, thus alleviating poverty and supporting the achievement of the Sustainable Development Goals (SDGs) (OECD, 2009). Natural resources such as forests not only serve as livelihood sources for rural households but also for those living in peri-urban and urban areas (Butler and Oluoch, 2006; Do et al. 2022).

Natural resources provide a variety of essential goods and services such as food, medicines, fodder, wood, game meat and many other non-timber products. They continue to play a significant role as an integral part of livelihoods in most African communities (Thakadu and Schuster, 2007). The harvesting or gathering of natural resources is one of the key livelihoods' strategies used by both urban and rural dwellers in developing countries to provide many vital products for consumption (Angelsen et al. 2014; Nguyen et al. 2018) and generating income from their sale (Angelsen et al. 2014; Nguyen et al. 2018).

Besides poverty alleviation, the use of natural resources in rural livelihoods plays multiple roles, which include income supplementation and provision of household nutrition and daily food consumption (Qureshi and Kumar, 1998; Shackleton et al. 2008; Babulo et al. 2009). They also contribute to economic growth, job creation, and poverty alleviation in many developing countries. A significant number of rural and urban households in Botswana and other nations in southern Africa are still dependent on natural resources for their livelihoods (Shackleton et al. 2001).

Botswana, like other countries in Southern Africa, is endowed with many natural resources which may satisfy regular requirements such as energy, shelter, medicine, cash income, and job creation (Kaoma and Shackleton, 2015; Ofoegbu et a. 2017). These resources have historically played and are still playing an important role in the lives of Batswana (Parratt, 1996). Many natural resources in Botswana have been exploited successfully on a commercial basis, however, the full potential of many has yet to be realized.

Methodology

The 2022 National Population and Housing Census data, obtained from Statistics Botswana, was used to analyze the contribution of natural resources to income and employment generation. The household sub-population data was analyzed using STATA 18. Descriptive statistics, in the form of frequencies and percentages were used to present the findings using tables and graphs.

Findings and Discussions

The results indicate of the 695, 647 households interviewed, only about 17.1% generate income from agricultural or natural resource activities. Of those with income from these activities, only about 7% of the households directly get income from natural resources. The most important source of income from natural resources is sale of veld products, at 45%, followed by tree planting (19.13%) and timber harvesting at 16.3% as shown in **Table 1**. Both men and women in Botswana are engaged in tree planting projects through the backyard nursery initiative supported by the Department of Forestry and Range

Resources, Ministry of Environment and Tourism with the aim of supporting livelihoods and sequestering carbon dioxide (CO_2). A backyard tree nursery where the seeds develop into seedlings before being planted out has been suggested as an effective way to capture carbon (Lewis et al. 2019).

Forests around the world contain significant levels of carbon (C) and as planted trees grow, they aid in reducing atmospheric CO_2 levels by storing carbon in their biomass. This has sparked global tree planting projects to counteract fossil fuel emissions (Kirschbaum et al. 2024) and achieve the goals of the United Nations Framework Convention on Climate Change (NFCCC) Paris Agreement which Botswana is a signatory and restrict the rise in global average temperature to below 2°C (Smith et al., 2016). Tree planting and sustainable timber harvesting complement each other, and could promote, not only income and employment generation, but also carbon sequestration. However, timber and firewood harvesting for commercial purposes may lead to deforestation. Deforestation is widely thought to have an impact on local, regional, and possibly global climates, as well as potentially contributing to global warming (Henderson-Sellers et al. 1993; Lean and Rowntree 1993; Zhang et al. 1996ab) which could be occurring in Botswana. When deforestation takes place, the carbon that is stored as biomass in trees is released back into the atmosphere as CO_2 which contributes to climate change.

In addition to earning cash income from natural resources, households supplement their incomes by selling homemade craftwork, which are mostly made from natural resources such as wood and plants. According to Terry (1999), the handicraft industry has an overall positive impact on individuals working in the sector, their families and communities, particularly rural dwellers, those with little or no formal education and other marginalized people.

TABLE 1: Important sources of income from timber and non-timber forest products

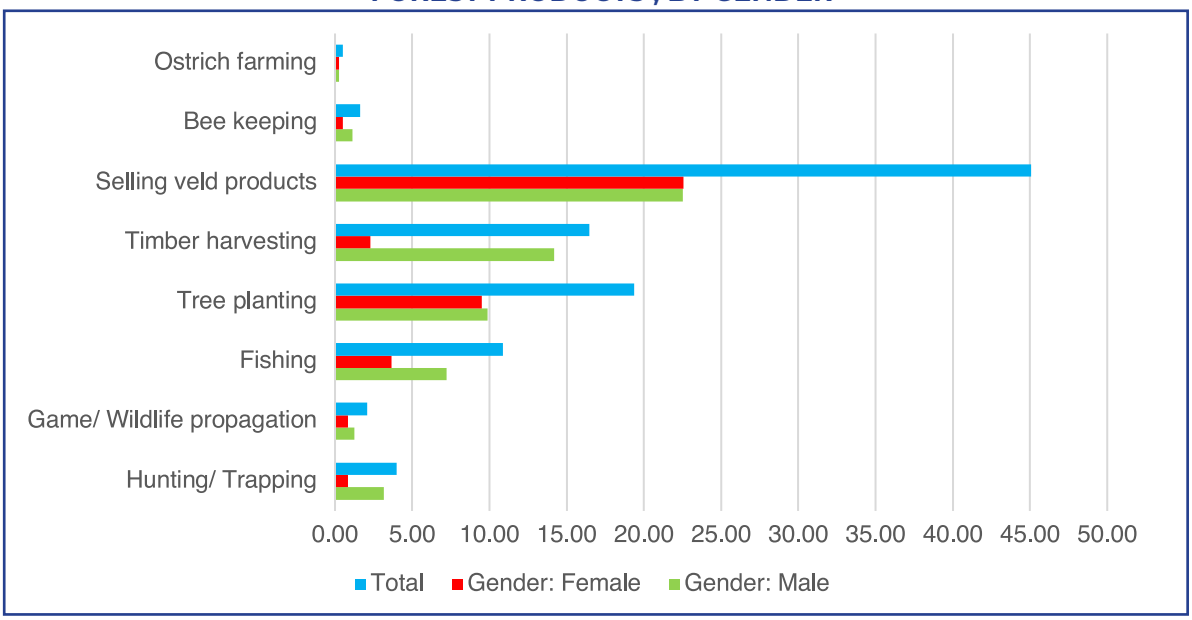
SOURCE OF CASH INCOME	FREQUENCY	PERCENTAGE
Hunting/trapping	333	4.0
Game/ wildlife	168	2.0
Fishing	970	11.8
Tree Planting	1, 573	19.1
Timber Harvesting	1, 344	16.3
Selling of veld products	3, 661	44.5
Bee keeping	132	1.6
Ostrich farming	42	0.5
TOTAL	**8, 223**	**100.0**

Concerning the use and management of natural resources, such as land, water, forests, trees, biomass (fuelwood, manure, etc.), livestock and fisheries, men and women have different responsibilities and roles. To enhance the involvement of women in natural resource management and conservation, it is essential to increase women's participation in natural resource governance, since they are the main actors in natural resource utilization (Agarwal, 2003, 2009). The importance of both women and men in the developing world and their involvement in the management and utilization of natural resources is acknowledged by the Convention on Biological Diversity (CBD) and the Global Plans of Action (Lambrou and Laub, 2004). The CBD advocates for fair and equitable sharing of genetic and natural resource benefits. The CBD supports equal and just distribution of genetic and natural resource benefits (Mashapa et al. 2020).

The results depicted in **Figure 1** indicate that more males than females receive cash from the sale of natural resources, except in the cases of tree planting and selling veld products. In general, there was no significant difference in the average earnings of men and women receiving income from natural resources. This is consistent with forest policy of Botswana which promotes equal engagement of men, youth, and women in in forest resources (Forest Policy, 2011). For a long time, gender equality has been recognized as a priority for development, and it is a key prerequisite for the achievement of the 2030 Agenda (Branisa et al. 2013). According to Sithole et al. (2021) the 2030 Agenda, which aims at eradicating poverty and achieving sustainable development worldwide by 2030, is a commitment to ensure that no one remains behind.

According to these results males earn significantly more money from activities like fishing, hunting/trapping, and beekeeping than their female counterparts because these are traditionally considered men's domains (Shackleton et al., 2011). Women normally dominate the spaces close to homesteads and crop fields where they collect veld products and firewood (Sithole et al. 2021) because they are usually engaged in many activities at home (Timko et al. 2010; Sithole et al. 2021).

FIGURE 1: MAIN INCOME SOURCES FROM TIMBER AND NON-TIMBER FOREST PRODUCTS , BY GENDER

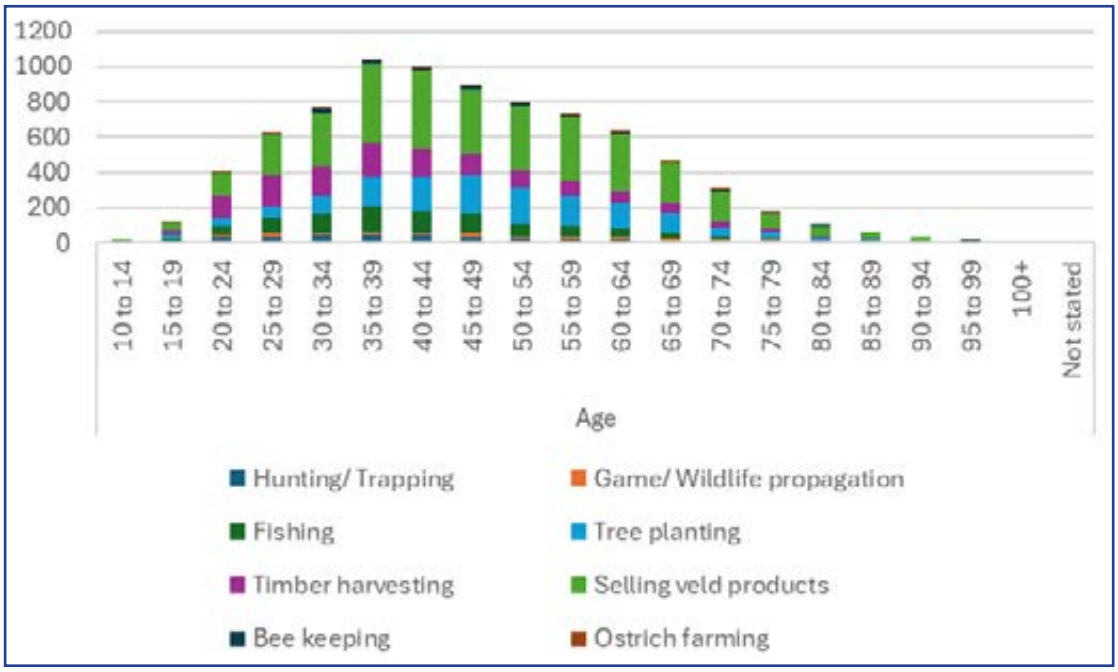


Timber harvesting generates significantly more income for men than their female counterparts. This activity requires the use of physically demanding tools and equipment such as axes and bow saws as well as chainsaws traditionally associated with men. Woodlands and forests where timber is harvested are frequently located far from village and are also deemed unsafe for women. Furthermore, timber is heavier and heavier to for women to lift and they also not to have access to donkey carts which used as transport in rural areas.

Women have a crucial role in activities related to natural resources that are vital for the management and utilization of these resources. Despite potentially having limited access to resources and financial support, women in Botswana are already involved in the veld products supply market. Women are often left out of formal decision-making processes or are only allowed to participate in a limited capacity. Nevertheless, their involvement can be improved by guaranteeing they have improved access to and management of essential natural resources like land, water, and forests that are vital and closely tied to their everyday tasks (Mugaya, 2020).

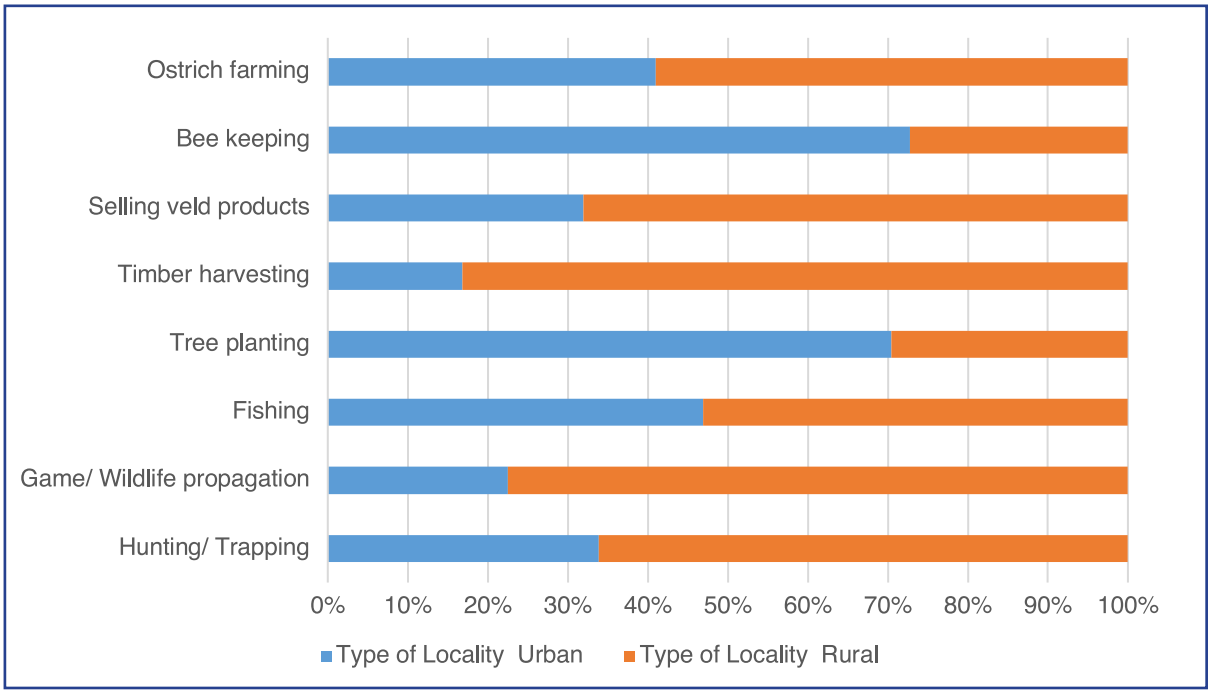
Figure 2 show that the age category that is most active in the natural resource utilization and marketing is the 35- to 39-year-olds (12.78%). All age categories derive income predominantly from sale of veld products, an indication of the need for the veld products value chain development for employment generation.

FIGURE 2: MAIN SOURCE IN INCOME FROM TIMBER AND NON-TIMBER PRODUCTS



The majority of those who benefit from natural resources are households in rural areas (60.88%) though the differences between the urban and rural households were not statistically significant. Terry (1999) also reported a positive impact of the handicrafts industry in Botswana, with greater benefits for individual producers and enterprises in rural areas than in urban areas. However, this is contrary to the findings of this study which showed that most households in urban, and/or urban villages (57%) earn income from sale of homemade craftwork. However, it is worth noting that most timber and non-timber resources sold in urban and semi-urban areas are harvested from rural areas. This is indicative of the potential for natural resources market value chain development to provide alternative livelihoods to agricultural activities and adaptation to climate change for rural households, who are often more vulnerable to climatic and socio-economic risks.

FIGURE 3: MAIN SOURCES OF INCOME FOR RURAL VS URBAN HOUSEHOLDS



Implications of the results depicted in Figure 3 clearly demonstrate the spatial distribution of the natural resources across the country which is locality specific. Figure 3 show that most activities occur in rural areas except tree planting and beekeeping which are associated with urban dwellers. From the previous population and housing census we observed increased trend in the use of natural resources for income generation.

Policy Implications

There is need to promote the development of the veld products value chains for income and employment generation, particularly for women and other vulnerable groups in rural areas to address the gender disparity between males and females. Effective development of natural resources value chains will ensure sustainable human social development and environment in line with Vision 2036, and attainment of SDG 1, 2 and 5 of no poverty, zero hunger and gender equality. There is need to develop a policy framework that promotes a circular flow model in natural resources utilization that will contribute to the attainment of target 12.2 of sustainable management and efficient use of natural resources by 2030, encapsulated in Goal 12 of sustainable consumption and production patterns.

Conclusions and Recommendations

Natural resources have great, untapped potential to generate employment and income particularly for households in rural areas, thus contributing to reduction in poverty and alleviation of hunger. It is recommended that the value chain for veld products should be developed and vulnerable groups such as women and youth should be market oriented to take up opportunities along the value chains. However, there is need to develop a circular economy model in the natural resources sector to ensure environmental sustainability even as the sector contributes to economic growth.

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ECONOMIC IMPORTANCE OF THE AGRICULTURAL SECTOR

[1]Keneilwe Kgosikoma,
[2]Davies M Pfukenyi,
[3]Gabotepele Maseko
[4]Ketshephaone Thutwa and
[5]Boingotlo Sebolai

EXECUTIVE SUMMARY

Income from agricultural activities contributes to households' investments in health and education in many countries. Agriculture can be a means of diversifying income-generating activities. Farming has been reported to be the highest source of household cash income in Vietnam (Cazzuffi, et al., 2020) and it was reported to be the second after cash/in-kind receipts in Botswana (Dwivedi, et al., 2014). The objectives of the National Policy on Agricultural Development include improving food security and to diversify the agricultural sector production for more income opportunities. Therefore, determining how agriculture contributes to household income and employment in this study establishes whether the country is heading towards meeting the policy objectives or not. Furthermore, Sustainable Development Goals number 1 (No poverty) and number 2 (zero hunger) can be addressed by agriculture as it has the potential to meet the household needs by contributing to income and nutrition. Agricultural practices can increase availability, affordability and consumption of diverse and nutritious food.

It is important to find out which agricultural activities are Batswana engaged in because diversification of production and diet is how agriculture contributes to nutrition. The aim of this study was to determine the economic contribution of the different agricultural sectors to household income and employment in Botswana using the 2022 National Population and Housing Census data. Descriptive statistics (frequencies and percentages) were used to analyze the primary data from the 2022 National Population and Housing Census using SPSS and SAS. Variables of interest were participation in agricultural activities, agricultural activities at household level, households producing agricultural products for sale or household use, self-employed in farm and agricultural activities that are a source of income to households. The results of the study suggest that more men are involved in agriculture than women. It can be concluded that most of Batswana do participate in agricultural activities, however, only a few are dependent on agriculture for income. There is a decrease in the percentage of farmers who obtain income from agricultural activities when compared to Botswana 2011 Population and Census Analytical Report. The main agricultural practices farmers are engaged in are livestock production, crop production and mixed farming. Selling livestock is the most common source of cash followed by ploughing services and selling crops. More men than women obtain cash from selling livestock, ploughing services and selling crops.

INTRODUCTION

Globally, 75% of the world's poor live in rural areas and their main source of livelihood is agriculture (Mbulawa, 2017) and about 48% of Africa's population relies directly on agriculture for economic and livelihoods needs (Africa Union, 2015). In Botswana, about 70% of rural households derive their livelihoods from agriculture through subsistence farming (UNDP, 2012, Statistics Botswana, 2015). The rate of growth of the economy via the agricultural sector is estimated to be twice as much faster in reducing poverty when compared with growth in other sectors (World Bank, 2008).

The agricultural sector in Botswana covers both crops and livestock production. Traditional farming is the most dominant in terms of numbers of people involved and the geographical coverage; with most farmers being small-scale farmers (UNDP, 2012). In Botswana, the sector plays an important role by providing food, income, employment and investment opportunities for most of the rural population (Sigwele and Orlowski, 2015). Agriculture historically played a significant role in the economy, but its contribution to the GDP has been gradually decreasing. The sector currently accounts for 2.8% of GDP and employs 30% of the workforce (Yaron et al., 2012) either as paid employees, self-employed on owned farms or doing unpaid work in family activities (Sigwele and Orlowski, 2015). Statistics Botswana (2014) revealed that almost 90% of the total rural labor force is directly or indirectly involved in agriculture. In both production systems, livestock production, especially beef cattle contribute the largest share (about 57%) to agricultural GDP (van Engelen et al., 2013). Livestock production accounts for more than 80% of income from agriculture while crops account for the remaining 20% (AFDB Group, 2023). Meat and meat products are the only agricultural commodities for which Botswana is a net exporter and over 95% of beef produced by commercial farms is exported (AFDB Group, 2023). However, between 2010 and 2018, earnings from beef exports dropped from USD 130 million to USD 80 million and since then exports have fallen further (AFDB Group, 2023). Vegetables and vegetable products are the next most important export earner, realizing almost USD 7.7 million in 2019. However, Botswana is a net importer of cereals, and the country produces about 200 000 tons of cereals annually, which is only about 17% of domestic consumption (AFDB Group, 2023).

The agriculture sector has experienced a steady decline in its contribution to the national GDP over the past 42 years. It has declined from a 42.7% share in GDP at independence in 1966 to 1.9% as at 2008 (Ministry of Finance and Development Planning, 2010). One of the main challenges in addressing hunger is poor performance of the agriculture sector (Africa Union, 2015). Hence, the poor performance of the agriculture sector in Botswana represents an added challenge to the fight against poverty (UNDP, 2012).

Evidence in Africa and elsewhere has shown that agricultural performance is central in driving socio-economic transformation, especially in the traditionally, economically marginalized and largely rural populations (Africa Union, 2015). Increasing agricultural productivity is fundamental for long-term poverty alleviation and overall economic growth in developing countries (Bravo-Ureta et al., 2007; Block, 2010). Accelerating productivity in agriculture is seen as one of the alternatives to support the diversification initiatives by the government and drive growth in Botswana (Mbulawa, 2017). Mbulawa (2017) showed that economic growth in Botswana can be improved in the short term by improvements in agricultural productivity. However, despite the decline in production, the Botswana agriculture sector remains vital in the country's fight against poverty as a large percentage of rural dwellers are dependent on subsistence, rain-fed agriculture. The sector remains a fundamental source of food and income for nearly 50% of the total population (FAO, 2005). Agricultural productivity in Botswana can be enhanced by providing adequate infrastructure, additional farming machinery per hectare of arable land and having a targeted approach in the provision of funding towards agricultural oriented initiatives (Mbulawa, 2017). The 2020 Economic Recovery and Transformation Plan of the country acknowledged that raising agricultural productivity is essential for job creation, enhancing self-sufficiency and improving the balance of payments.

PURPOSE OF THE STUDY

Approximately 36% of the population in Botswana lives in the rural parts of the country (Statistics Botswana, 2018), where agricultural production is the principal economic activity that sustains the livelihoods of the households. The agricultural sector plays an important role by providing food, income, employment, and investment opportunities for most of the rural population (Sigwele and Orlowski, 2015). Some households earn income from agricultural activities undertaken in the holdings. The households sell their crop produce and livestock to earn a living while some produce is for household consumption. According to Sigwele and Orlowski, (2015), agriculture constituted 26.5% of all who were employed (153,000 people), with 39,300 in paid employment, 91,800 worked in own lands and cattle posts while 19,500 did unpaid work in family activity. In terms of employment in the commercial sector, the majority (81%) of farmers employ hired labor. On average, each farm employs about 3 employees (Botswana Agricultural Census, 2015). It is therefore imperative to determine the economic contribution of the different agricultural sectors on employment, household income and nutrition.

THE SIGNIFICANCE OF THE STUDY

Analyzing the economic importance of the agricultural sector in this study gives an in-depth understanding of the agricultural sector's economic significance, as well as important insights that can be used to inform policy decisions, investment strategies and sustainable practices. This study emphasizes agriculture's critical role in attaining holistic and equitable economic development by examining its contributions to income diversification, employment, and food security.

Objectives of the Study

To assess the status of the country in attaining local, regional, and global development objectives, it is critical to analyze national census data to understand the economic importance of the agriculture sector. Therefore, the main objective of this paper was to analyze the economic importance of the agricultural sector in Botswana using the 2022 Population and Housing Census data.

The specific objectives were to determine:

- **The socio-demographic characteristics of households involved in agricultural activities,**
- **The predominant use of agricultural produce at household level,**
- **The agricultural activities households actively engage in for employment and income generation,**
- **Differentials in agricultural participation by gender, age, level of education and district or region**.

LITERATURE REVIEW

The agricultural sector contributes greatly to development and growth of the economy in developing countries compared to developed countries. This is because in developing countries the economy is not as diversified as in developed countries. The importance of the agricultural sector has been reported in South Africa (Meyer, 2019) and in Botswana where it is the second source of household income after cash/in-kind receipts (Dwivedi, et al., 2014). Agriculture can contribute to the growth of the economy through ensuring food security, supplying inputs to the food industry, creating employment and foreign exchange (Danso-Abbeam et al. 2019). The Botswana 2011 Population and Census Analytical Report showed that about 30% of households received income from one and more than one agricultural activity and the highest (41.4%) were from rural settlements (Dwivedi, et al., 2014). The highest percentage of households receiving income from agricultural activities were from the Central (42%) district, followed by Kgalagadi/Ghanzi (39%) and Southern (32%) (Dwivedi, et al., 2014).

In Botswana the livestock sector has fared much better over the years compared to the crop sector. Out of the 30% households receiving income from agricultural activities, 17% of them received income from the livestock sector and 13% from the other agricultural sectors (Dwivedi, et al., 2014). Except for cattle, the volumes and diversity of livestock has shown increases with minor fluctuations owing to drought and diseases (Statistics Botswana, 2012). Productivity indicators for cattle have remained stagnant over time while those for the small stock industry also indicate poor performance with limited commercialization (African Development Bank [AFDB] Group, 2023). However, the cattle population showed a decline in 2019 due to an increase in mortality while goats and sheep showed a marked improvement (Statistics Botswana, 2020), The good performance of the small stock production has been attributed to government programs such as LIMID and Poverty Eradication as well as low mortality recorded for goats and sheep (Statistics Botswana, 2020). Promising areas of agriculture are the emerging high value subsectors or non-traditional agriculture that include poultry, dairy and horticulture (AFDB Group, 2023). The poultry subsector has witnessed a massive growth and transformation, and Botswana is now self-sufficient in chicken meat and eggs (AFDB Group, 2023). Poultry (36.6%) was reported to be the most kept livestock by households followed by cattle (34.9%), goats (33.3%), donkeys/mules (16.4%) and sheep (6.7%) (Ama, et al., 2014). Dairy output has also expanded by a factor of 2 between 1997 and 2007 and horticulture by a factor of 5.5 (AFDB Group, 2023). Ostrich, piggery, beekeeping, fisheries and forestry remain underdeveloped in Botswana (AFDB Group, 2023), but a marked increase in the percentage change of pigs (71.2%) and ostriches (94.8%) ownership between 2001 and 2011 census periods was reported (Ama, et al., 2014). However, in real terms, the livestock value has been declining over the years (UNDP, 2012). Crop production has been the most vulnerable part of the agricultural sector due to its heavy reliance on rainfall (UNDP, 2012). Arable production showed a downward production trend in all the major crops in 2019 compared to the 2017 Annual Agricultural Survey results (Statistics Botswana, 2020). Sorghum (86.2%), maize (92.9%), millet (71.5%) and beans/pulses (75.2%) recorded significant production reductions between the 2017 and 2019 agricultural seasons (Statistics Botswana, 2020). The beef industry is the only subsector that has constantly remained a significant contributor to the national GDP.

The participation of female-headed households in livestock keeping and crop plant was reported to be still lower than those of their male counterparts (Ama, et al., 2014). Based on the 2011 Botswana census data it was recommended that empowerment of female-headed households be intensified, and that more agricultural education should be provided to the farming households to enhance agricultural production (Ama, et al., 2014).

The Botswana government formulated and implemented the National Agricultural Policy (NAP) with the objective of developing a sustainable agricultural sector (Ministry of Agriculture, 2014). This policy has been dominated by farm-level programs such as the Arable Lands Development Program (ALDEP), Accelerated Rainfed Arable Program (ARAP), National Master Plan for Agriculture and Dairy Development (NAMPAADD), the Integrated Support Programme for Arable Agricultural Production (ISPAAD) and the Livestock Management and Infrastructure Development (Sigwele and Orlowski, 2015). However, despite the various policies and programs to improve agricultural performance, output and productivity continue to decline, leading to a progressive increase in food imports (Jefferis, 2010; van Engelen et al., 2013; Sigwele and Orlowski, 2015). Thus, the performance of the Botswana agricultural sector has remained below 5% in recent years which is unsustainable leading to decline in farm incomes and worsening poverty levels (Yaron et al., 2012). It remained the slowest growing economic sector during the National Development Plan 11 (NDP11) period (2017-2023) currently contributing less than 5% of GDP (World Bank, 2017).

METHODOLOGY

Primary cross-sectional data from the 2022 Population and Housing Census were used for analysis. The data were cleaned and recoded accordingly to get the variables pertaining to the economic importance of the Botswana agricultural sector. Descriptive statistical methods were applied in the form of frequency tables where frequencies were based on the responses, means and standard deviations and graphs. Gender, age, education and district differentials were analyzed to give an indication of the role of agriculture in income and employment generation by gender, age, level of education and district.

DATA LIMITATIONS

The data provided were not disaggregated for the variables for livestock and crop ownership, cash income from agricultural activities, and thus it was not possible to analyze age, education, and district differentials. Instead, a dummy variable was created for those who participate and those who do not participate in either livestock or crop production.

FINDINGS AND DISCUSSIONS

The households' socio-demographic characteristics are presented in **Table 1**. The results showed that 695, 703 households were surveyed. Of these, about 65.67% undertook agricultural activities, predominantly for household use. This percentage is much higher than the one recorded in South Africa where less than 20% of households were participating in agricultural activities (David and Grobler, 2019). This discrepancy might be because South Africa is more developed than Botswana, therefore her people have other activities that they participate in to live. Most of the household heads were male (55.0%), predominantly in the 30 to 39 years age group. The results are consistent with 2011 Botswana census data where more male-headed households were reported to be participating in agricultural activities than female-headed households. Furthermore, the results concur with the findings of David and Grobler, (2019) in South Africa. The mean age of the household head was 45.5 years with a standard deviation of 16.1 years. The mean age of the household head in this study is similar to the one reported in South Africa and in Madagascar (David Grobler, 2019; Herrera et al., 2021). The youths (10 - 39 years) make up 14.5% of the total population, and 32% of the total agricultural population (not in Table 1). Most of the participants never married (54.9%), followed by 24.6% who were married and 12.4% who were living together.

Almost 60% of the households were gainfully employed and the majority (65.7%) live in urban areas. Of these, 6.8% work only at their own agricultural ventures. Agricultural production is still predominantly for subsistence use, with about 47% of the households producing only for household use and 40.9% produced predominantly for household use with the excess being sold. This is not surprising because most of these households' heads are still working in non-agricultural sectors, therefore, they do not have much time to commercialize their agricultural activities. Only about 10.4% produced primarily for the market. However, agriculture is still the mainstay of many households and about 65% participated in agricultural activities, though only about 15% derived income from it, indicating a need for market orientation initiatives. This indicates a decrease in the number of households that obtain income from agricultural activities because in Botswana 2011 Census data 30% of households got their income from agricultural activities. The 15% income derived from agricultural activities is also lower than the 22% reported in Madagascar (Stifel, 2010).

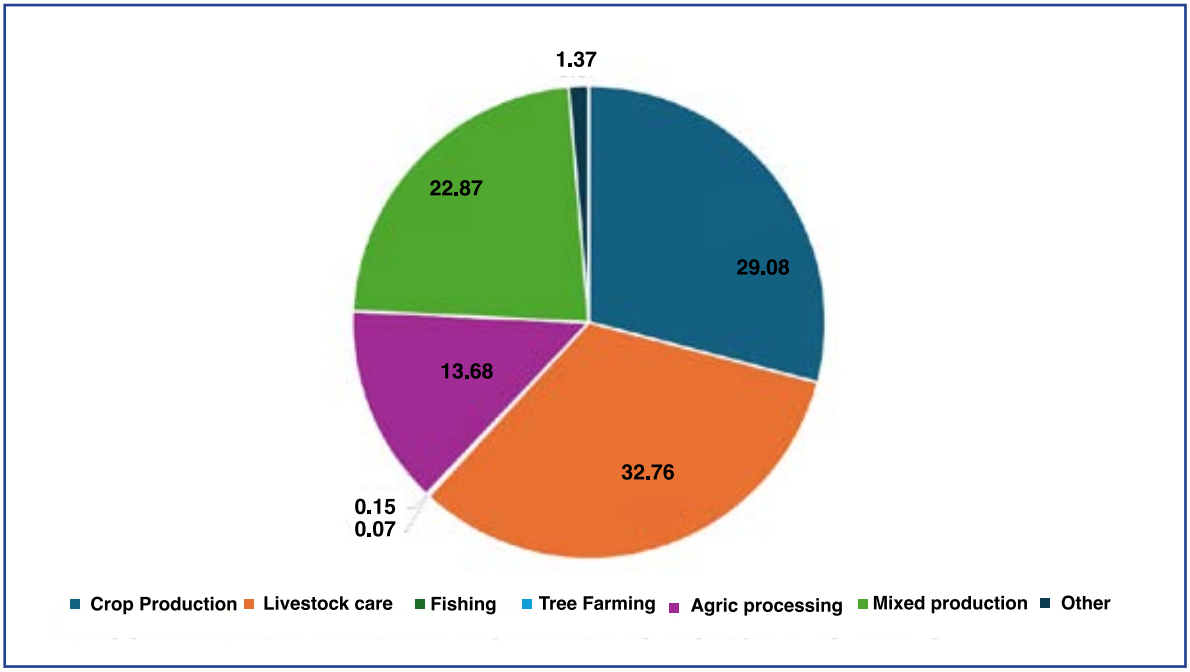
In terms of educational level, a little over three-fourths (76.1%) of individuals had completed school, while 10.0% were still at school and 7.6% discontinued. The individuals who never attended school were 5.6%.

TABLE 1: Households' Socio-Demographic Characteristics

VARIABLE	PERCENTAGE
SEX	
Male	55.0
Female	45.0
AGE GROUP	
10 – 19	1.4
20 – 29	14.7
30 – 39	25.0
40 – 49	23.5
50 – 59	15.7
60 – 69	11.0
70 – 79	5.5
80 – 89	2.5
90 – 99	0.7
100+	0.1
MARITAL STATUS	
Married	24.6
Never married	54.9
Co-habiting	12.4
Separated	0.3
Divorced	2.1
Widowed	5.3
Divorced, living together	0.2
Windowed, living together	0.1
AGRICULTURAL PARTICIPATION	
Yes	65.7
No	34.3
AGRICULTURAL INCOME	
Yes	14.7
No	85.3
LOCALITY	
Urban	65.7
Rural	34.3

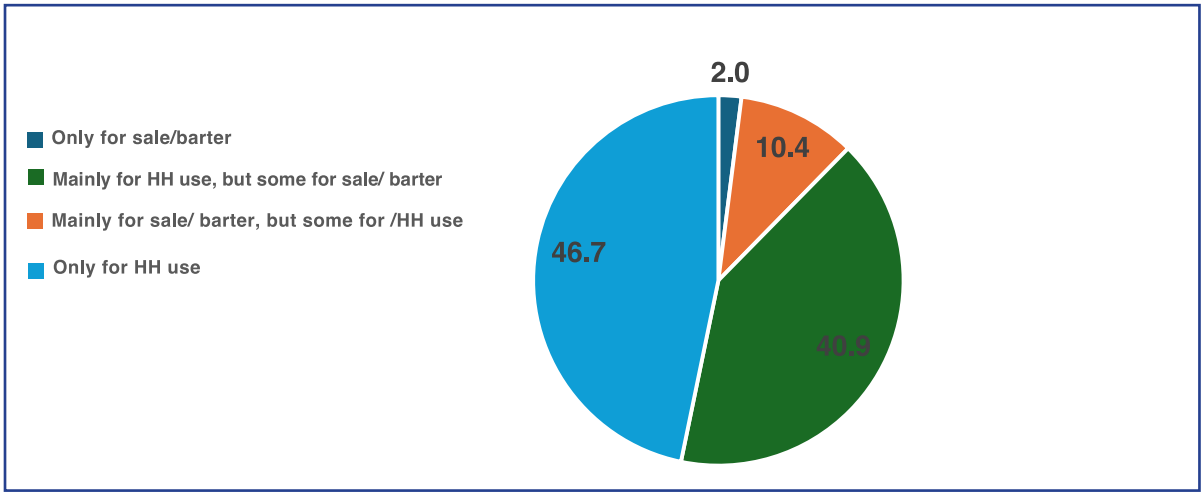
There were several agricultural activities that the participants were engaged in. According to the results, the main agricultural activity for those solely focused on agricultural activity was livestock production (32.8%), followed by crop production (29.1%) and mixed farming (22.9%) **(Figure 1)**. Mixed farming is an important agricultural risk mitigation strategy. Agricultural production for household use comprised 13.7% of the households.

FIGURE 4: PERCENTAGES OF MAIN AGRICULTURAL ACTIVITIES



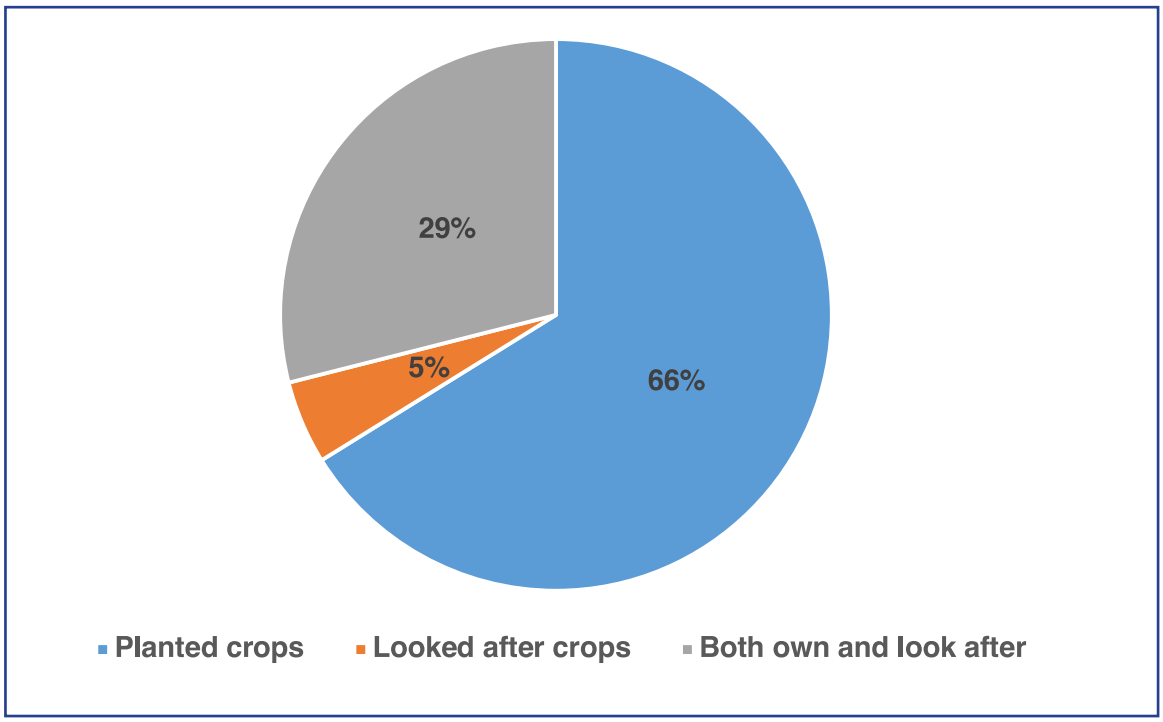
The products from agricultural and natural resources activities are still predominantly for households' use, which shows the low levels on entrepreneurship at that level. According to **Figure 2** below, most households still produce for household use, with only 2% producing solely for the market. This indicates the need for market orientation at the household level, for meaningful economic gain from agricultural and natural resources.

FIGURE 5: PERCENTAGES OF INTENDED DESTINATION PRODUCTS FROM AGRICULTURAL ACTIVITIES



Agricultural production provides livelihood alternatives for households, predominantly in rural areas, with about 15% of households earning income from agricultural activities. Male-headed households were more economically active, with over 60% of them engaged in agricultural activity for income, being male. The main source of income for both male and female-headed households was selling livestock with 49.5% of households earning income from it, followed by ploughing and crop production activities at 17.1% and 12.1%, respectively **(Table 2)**. Contrary to this study, in India, Birthal et al. (2014) reported that households obtain income by mostly selling crops than livestock.

FIGURE 3: PERCENTAGE OF HOUSEHOLDS ENGAGED IN CROP PRODUCTION



Most households were actively engaged in crop production, though they were not the ones taking care of the crops after planting (66%). However, 29% planted and looked after the crops instead of sourcing external labor. This indicates the importance of crop production to employment, and contribution to household food security as most of the produce are utilized for household use. Only a small percentage of households looked after crops as a form of employment, without ownership.

There was a similar number of households involved in livestock production (66%). About 25% owned and looked after their own livestock, and 9% were employed to look after the livestock, predominantly male. However, the results indicated that only 17% of households got cash income from agricultural activities. The most important source of agricultural cash income was selling livestock, with almost 50% of the households earning income from livestock sale. This was followed by ploughing services at 17% and poultry and selling crops, both at 9% of the households earning cash income from agricultural activities.

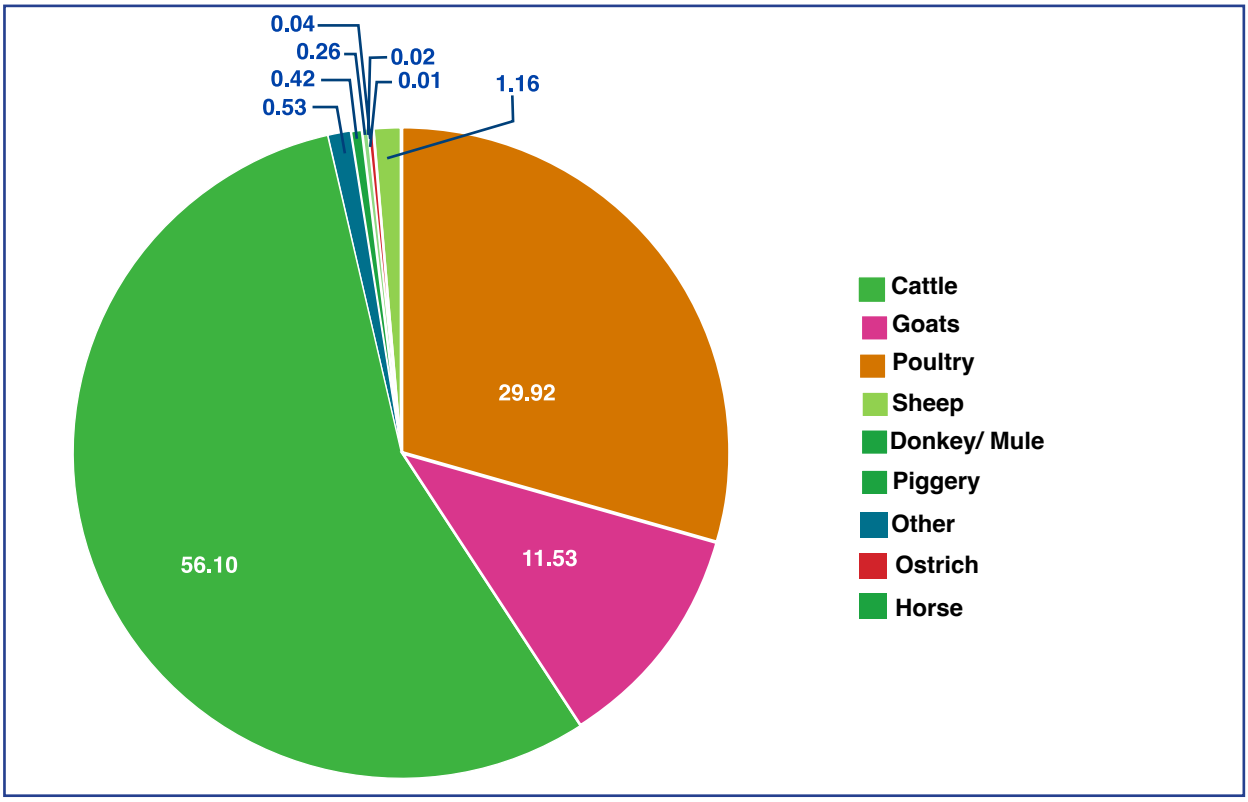
TABLE 2: Main Sources Of Agricultural Cash Income, By Sex

SOURCE OF AGRICULTURAL CASH INCOME	SEX				TOTAL	
	MALE					
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Ploughing services	10,338	10.1	7,263	7.1	17,601	17.1
Selling livestock	34,369	33.4	16,599	16.1	50,968	49.5
Selling crops	9,262	9.0	43	0.0	9,305	9.0
Piggery	322	0.3	120	0.1	442	0.4
Bee keeping	92	0.1	40	0.0	132	0.1
Dairy production	1,174	1.1	379	0.4	1,553	1.5
Ostrich farming	21	0.0	21	0.0	42	0.0
Poultry	5,339	5.2	4,889	4.8	10,228	9.9
Horticulture	736	0.7	463	0.5	1,199	1.2
Sorghum/maize processing	465	0.5	337	0.3	802	0.8
Fruits and Vegetable processing	528	0.5	561	0.6	1,089	1.1
Hides and skins processing	309	0.3	225	0.2	534	0.5
Other	4,912	4.8	4,068	4.0	8,980	8.7
Total	**67,867**	**66.0**	**35,008**	**34.0**	**102,875**	**100.0**

There was very low economic gain from non-traditional agricultural activities such as fishing, and agricultural processing (grains, fruits and vegetables and hides and skins). However, these have great potential, as there is relatively low capital investment and specialized knowledge and skills required.

Similarly, the predominant livestock kept was cattle, owned by 56% of the households involved in agricultural activities, followed by goat and poultry production, at 30% and 12%, respectively. This differed from the trends in 2011 NPHC, where the predominant livestock was poultry, followed by cattle and goats. Diversification to non-traditional livestock is still a challenge for most of the households, with less than 0.5% venturing into piggery, ostrich, game, horse, or donkey/ mule production. Livestock diversification is a potential risk mitigation strategy in the face of climate change, and more households need to consider it.

FIGURE 4: PERCENTAGE OF HOUSEHOLDS OWNING DIFFERENT TYPES OF LIVESTOCK



POLICY IMPLICATIONS

The 2022 census results identified piggery, dairy produce, horticulture and hides and skins as areas with potential to diversify agriculture as well as natural resources utilization areas namely fishing and tree planting as potential areas of growth. There is need for a policy supporting piggery and dairy production, financial support, training and skills development of farmers, youth engagement, value chain development. Hides and skins sub-sector needs to be encouraged because is part of the beef value chain. A policy also for natural resources conservation and sustainable exploitation is needed.

Thus, a policy to sustainably harvest and manage the natural resources is required. There is need to develop policies that encourage farmers to be involved in some new areas with a potential to contribute to diversification of agriculture. The agriculture sector needs to be supported through training, education, financial aid, extension, and skills development. Women empowerment is also necessary and a gender gap closing policy is required.

There is need to develop a policy to incentivize experienced farmers to avail their farms for use in attachments and internships thereby promoting youth acquisition of employable skills and increase the farms resource base in line with National Youth Policy strategy of "Promoting local and international volunteerism schemes that will utilize the pool of unemployed youth."

CONCLUSION AND RECOMMENDATIONS

This study suggested that more men are involved in agriculture than women. It can be concluded that most of Batswana do participate in agricultural activities, however, only a few are dependent on agriculture for income. The main agricultural practices farmers were engaged in were livestock production, crop production and mixed farming. Selling livestock was the most common source of cash followed by ploughing services and selling crops. More men than women obtained cash from selling livestock, ploughing services and selling crops. It is recommended that; females should be encouraged to get into agriculture and utilize agricultural programs such as Temo Letlotlo and Thuo-Letlotlo, farmers should be trained and encouraged to commercialize agriculture, more trainings need to be done to encourage Batswana to do non-popular agricultural activities such as fish aquaculture and farm products processing.

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APPENDIX 1: Proportion Of Households Who Participated In Agricultural Activities, By Education

HIGHEST LEVEL OF EDUCATION	NO PARTICIPATION		PARTICIPATION		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Preschool	272	0.0	720	0.1	992	0.2
Primary	46,401	7.6	82,538	13.6	128,939	21.2
Secondary	171,473	28.2	115,338	19.0	286,811	47.2
Non-formal	2,491	0.4	6,311	1.0	8,802	1.4
Certificate	24,090	4.0	11,987	2.0	36,077	6.1
Diploma	53,417	8.8	13,367	2.2	66,784	11.0
Degree	48,553	8.0	13,807	2.3	62,360	10.3
Post graduate	7,590	1.2	1,393	0.2	8,983	1.5
Other degrees	7,091	1.2	1,966	0.3	9,057	1.5
Not stated	16	0.0	62	0.0	78	0.0
Total	**361,394**	**59.3**	**247,489**	**40.7**	**608,883**	**100.0**

APPENDIX 2: Proportion Of The Population Who Participate In Agricultural Activities By Age

AGE GROUP	NO PARTICIPATION		PARTICIPATION		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
10-14	14	0.0	762	0.1	776	0.1
15-19	2,657	0.3	6,181	0.9	8,838	1.3
20-24	19,806	2.9	18,011	2.6	37,817	5.4
25-29	42,098	6.1	22,292	3.2	64,390	9.3
30-34	54,245	7.8	25,154	3.6	79,399	11.4
35-39	65,544	9.4	28,700	4.1	94,244	13.6
40-45	60,410	8.7	27,370	3.9	87,780	12.6
45-49	50,634	7.3	24,875	3.6	75,509	10.9
50-54	36,317	5.2	22,609	3.3	58,926	8.5
55-59	25,387	3.7	24,662	3.6	50,049	7.2
60-64	11,573	1.7	30,407	4.4	41,980	6.0
65-69	6,123	0.9	27,877	4.0	34,000	4.9
70-74	2,874	0.4	20,324	2.9	23,198	3.3
75-79	1,283	0.2	14,081	2.0	15,364	2.2
80-84	663	0.1	10,706	1.5	11,369	1.6
85-89	233	0.0	6,096	0.9	6,329	0.9
90-94	101	0.0	3,687	0.5	3,788	0.5
95-99	33	0.0	1,200	0.2	1,233	0.2
100+	11	0.0	445	0.1	456	0.1
Not stated	0	0.0	204	0.0	204	0.0
Total	**380,006**	**54.7**	**315,643**	**45.4**	**695,649**	**100.0**

APPENDIX 3: Proportion Of The Population Who Participate In Agricultural Activities, By Locality

LOCALITY	NO PARTICIPATION		PARTICIPATION		TOTAL	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Town	111,110	16.0	38,782	5.6	149,892	21.6
Urban village	172,747	24.8	144,107	20.7	316,854	45.6
Rural	96,180	13.8	132,766	19.1	228,946	32.8
Total	**380,037**	**54.6**	**315,655**	**45.4**	**695,692**	**100.0**

APPENDIX 4: Proportion Of The Population Who Participate In Agricultural Activities By District

DISTRICT	NO PARTICIPATION		PARTICIPATION		TOTAL	
	FREQUENCY	%	FREQUENCY	%	FREQUENCY	%
GABORONE	61,247	8.8	20,945	3.0	82,192	11.8
FRANCISTOWN	24,070	3.5	9,853	1.4	33,923	4.9
LOBATSE	7,138	1.0	2,663	0.4	9,801	1.4
SELIBE PHIKWE	9,055	1.3	4,214	0.6	13,269	1.9
ORAPA	2,830	0.4	207	0.0	3,037	0.4
JWANENG	5,705	0.8	865	0.1	6,570	0.9
SOWA	1,065	0.2	35	0.0	1,100	0.2
SOUTHERN	15,992	2.3	21,670	3.1	37,662	5.4
BAROLONG	6,815	1.0	9,607	1.4	16,422	2.4
NGWAKETSE WEST	3,053	0.4	3,502	0.5	6,555	0.9
SOUTH EAST	22,635	3.3	13,547	2.0	36,182	5.2
KWENENG EAST	52,984	7.6	48,03	6.9	101,014	14.5
KWENENG WEST	6,764	1.0	9,091	1.3	15,855	2.3
KGATLENG (Wards)	19,047	2.7	17,330	2.5	36,377	5.2
CENTRAL SEROWE -PALAP	26,582	3.8	30,203	4.3	56,785	8.2
CENTRAL MAHALAPYE	14,756	2.1	21,758	3.1	36,514	5.3
CENTRAL BOBONONG	10,405	1.5	11,675	1.7	22,080	3.2
CENTRAL BOTETI	10,837	1.6	10,366	1.5	21,203	3.1
CENTRAL TUTUME	20,222	2.9	26,206	3.8	46,428	6.7
NORTH EAST	11,181	1.6	9,634	1.4	20,815	3.0
NGAMILAND EAST	15,976	2.3	15,582	2.2	31,558	4.5
NGAMILAND WEST	6,686	1.0	11,059	1.6	17,745	2.6
Chobe	7,195	1.0	2,867	0.4	10,062	1.5
DELTA	58	0.0	132	0.0	190	0.0
GHANZI	8,552	1.2	6,880	1.0	15,432	2.2
CKGR	11	0.0	71	0.0	82	0.0
KGALAGADI SOUTH	5,120	0.7	4,588	0.7	9,708	1.3
KGALAGADI NORTH	4,056	0.6	3,075	0.4	7,131	1.0
Total	**380,037**	**54.6**	**315,655**	**45.3**	**695,692**	**100.0**

MULTI-DIMENSIONAL ENERGY POVERTY INDEX FOR BOTSWANA

Khaufelo Raymond Lekobane

EXECUTIVE SUMMARY

The 2030 Agenda for Sustainable Development recognizes the importance of energy. This is captured by SDG 7, which aims to ensure universal access to affordable, reliable, sustainable, and modern energy by 2030. Agenda 2063 also recognizes energy as a critical commodity for African households. Even with this, access to modern energy is a huge challenge in many Sub-Saharan African (SSA) countries. Most of those with no access to clean energy live in SSA and mostly in rural areas and low-income households. Despite this, studies dealing with energy poverty in SSA remain scarce.

The Government of Botswana strives to expand access to sustainable renewable energy and has implemented several interventions to increase the adoption and use of modern and clean energy. These include the 2012 Energy Master Plan, the National Photovoltaic Rural Electrification Programme, and the 2021 National Energy Policy. The importance of energy is also outlined in key national development documents such as Vision 2036 and the 2024 National Transformation Strategy. Despite these interventions, Botswana continues to experience energy shortages affecting many households. The use of renewable energy remains well below the country's potential. Considering this, it is essential to investigate the situation of energy poverty in Botswana. Understanding energy poverty is critical since it affects how it is defined and measured, which in turn influences interventions to alleviate it.

Therefore, the primary objective of this study is to construct the multi-dimensional energy poverty index (MEPI) for Botswana. The secondary objective is to investigate the level and extent of energy poverty across districts in Botswana. Our MEPI accounts for five (5) dimensions comprising six (6) energy deprivation indicators. We employed the framework of capability approach to conceptualize energy poverty. In this case, energy poverty is conceptualized as a multi-dimensional concept. For aggregation, we used the Alkire-Foster (AF) methodology. To our knowledge, no study has examined multi-dimensional energy poverty in Botswana. Thus, this study provides the first attempt and contributes to the literature.

The unidimensional results reveal that most households are deprived in services provided by means of household appliances (37.1%) followed by cooking fuel (31.8%) and access to electricity (lighting). Concerning entertainment or education appliances, 23.5% of households are deprived, while 13.5% are exposed to indoor air pollution. The deprivation levels differ significantly across districts, with Kweneng West, Ngwaketse West and Ngamiland West recording higher deprivation rates. The results reveal that 34.7% of the households in Botswana are multi-dimensionally energy poor. The intensity of multi-dimensional energy poverty is estimated at 0.591, meaning, on average, the multi-dimensional energy poor households are simultaneously deprived in 59.1% of the indicators considered. The adjusted headcount ratio is estimated at 0.205. These results show that multi-dimensional energy poverty in Botswana remains a challenge.

The results further reveal that except for the Delta and CKGR, Kweneng West (77%), Ngwaketse West (75.3%) and Ngamiland West (68.9%) experienced the highest incidences of multi-dimensional energy poverty. The same picture is observed based on the intensity of multi-dimensional energy poverty and MEPI. In contrast, Sowa Town and Orapa experienced the lowest levels of multi-dimensional energy poverty. These two districts are mining towns with good infrastructure, and access to essential services such as water, electricity and health are freely provided. The robustness analysis proves that even though normative decisions were employed when constructing MEPI, the public policy conclusions drawn from the index are robust to a choice of diverse parameters. The findings of this study provide some policy implications for multi-dimensional energy poverty in Botswana. Overall, using MEPI within the capability approach framework can help policymakers adopt a more nuanced understanding of energy poverty and design more effective and sustainable interventions to address it.

INTRODUCTION

The 2030 Agenda for Sustainable Development has recognized the importance of energy. This has led to the inclusion of energy in the Sustainable Development Goals (SDGs). Specifically, SDG 7 aims to ensure universal access to affordable, reliable, sustainable, and modern energy by the year 2030 (UN, 2015). Agenda 2063 also recognizes energy as a critical commodity for African households (AUC, 2015). Household access and use of clean energy are thus central to global development (Crentsil et al., 2019). However, access to modern energy is a huge challenge in many developing countries, especially in Sub-Saharan African (SSA) countries (International Energy Agency [IEA], 2015). According to the International Energy Agency (IEA), about 600 million people of the total 730 million people with no access to clean energy live in SSA (IEA, 2020) and are primarily found in rural areas and low-income households (Danielsson & Ekman, 2023). Despite this, studies dealing with energy poverty in SSA remain scarce (Crentsil et al., 2019; Adusah-Poku & Takeuchi, 2019).

The Government of Botswana strives to expand access to sustainable renewable energy and has implemented several interventions to increase the adoption and use of modern and clean energy. The 2012 Energy Master Plan (EMP) ensures everyone can access essential energy services, such as lighting, cooking, and heating, by integrating off-grid and grid technologies into its rural electrification initiative (Republic of Botswana, 2012). The National Photovoltaic Rural Electrification Programme (NPVREP) aims at providing photovoltaic energy to rural households and institutions at affordable financial terms. The NPVREP facilitates rural communities in Botswana to access the facility to purchase photovoltaic systems and repay the loan over four years (Chimbombi, 2003). The 2001 Revised National Policy for Rural Development also emphasizes the role of solar photovoltaic systems in rural electrification and development (Republic of Botswana, 2001).

The 2021 National Energy Policy (NEP) seeks to promote and facilitate optimal usage of available energy resources to increase access to modern energy services to power economic growth and improve the livelihoods of Batswana (Republic of Botswana, 2021). Vision 2036 also recognizes energy as essential to social and economic development. The critical factors for sustainable energy are availability, accessibility, safety, affordability, and reliability (Republic of Botswana, 2016). The 2024 National Transformation Strategy (NTS) aims to achieve national energy security by 2036 (Republic of Botswana, 2024).

Despite these interventions, Botswana continues to experience energy shortages affecting many households. The use of renewable energy remains well below the country's potential. Data show that a total of 73.4% of households in Botswana are connected to the National Grid (see Figure 2 in the appendix). The majority of these are in cities and towns. The exorbitant cost of connections, frequently regarded as prohibitive, prevents many low-income households, especially those in rural areas, from connecting to the National Grid. Concerning fuel used for cooking, the primary fuel sources in Botswana are LPG (34.9%), followed by wood (29.7%) and electricity (25.3%). Biogas accounted for 7.2%. The remaining cooking fuels account for less than 1% (see Figure 3 in the appendix). It is, therefore, essential to investigate the situation of energy poverty in Botswana.

Therefore, the primary objective of this study is to construct the multi-dimensional energy poverty index (MEPI) for Botswana. The secondary objective is to investigate the level and extent of energy poverty across districts in Botswana. We construct a MEPI using the Alkire-Foster (AF) methodology (Alkire & Foster, 2011a, 2011b). The findings of this study will provide some policy implications on multi-dimensional energy poverty in Botswana. To our knowledge, no study has examined multi-dimensional energy poverty in Botswana. Thus, this study provides the first attempt and contributes to the literature.

LITERATURE REVIEW

Understanding energy poverty is critical since it affects how it is defined and measured, which in turn influences interventions put in place to alleviate it (Pachauri & Spreng, 2011). Efforts to measure energy poverty have been based on unidimensional binary indicators such as access to modern energy or the use of clean energy (Mendoza et al., 2019). However, these binary indicators do not accurately represent the energy situation. Given the multi-dimensional nature of energy poverty, several composite indices have been proposed and developed. These composite indices aggregate different indicators of energy poverty into a single number into a single number that is easy to compare across time and nations (Nussbaumer et al., 2013). These include the Energy Development Index (EDI) (International Energy Agency [IEA], 2014); Multi-dimensional Energy Poverty Index (MEPI) (Nussbaumer et al., 2012), Energy Poverty Index (EPI) (Tirado-Herrero & Bouzarovski, 2014; Mirza & Szirmal, 2010) and Compound Energy Poverty Indicator (CEPI) (Maxim et al., 2016). The issue of which method best measures multi-dimensional energy poverty is still being debated (Mendoza et al., 2019). Therefore, which method to use depends on the type of data and the conceptual framework adopted to define energy poverty.

The concept of energy poverty is multi-dimensional (Crentsil et al., 2019), so there is no single definition of energy poverty. Considering this, and due to differences in experiencing and understanding energy poverty, defining energy poverty has proved to be a challenge (Sokołowski et al., 2020). Boardman (1991) conceptualized the issue of energy poverty, defined it in terms of fuel poverty, and expressed it as "households whose fuel expenditure on all energy services exceeded 10% of their income". Since then, several definitions have been proposed in empirical literature. Bouzarovski and Petrova (2015) define energy poverty as the inability to attain a socially and materially necessitated level of domestic energy services. Middlemiss and Gillard (2015) defined energy poverty as the inability of certain households to acquire the energy services required to live a decent and healthy life. Thomson et al. (2017) define energy poverty as a situation when a household is unable to afford the energy needed to provide its members with adequate warmth, cooling, lighting, and appliance use.

Day et al. (2016) conceptualized poverty using the Capability Approach (CA) and defined energy poverty as "an inability to realize essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realizing these capabilities" (p.260). They argue that defining energy poverty in terms of capabilities in this way draws attention to its impacts on multiple dimensions of wellbeing and human flourishing (Melin et al., 2021). The CA emphasize the role of access to energy services (or lack thereof) in achieving socio-economic wellbeing and sustaining quality of life (Sokołowski et al., 2022). [1]We follow Day et al. (2016) and conceptual energy using the CA. In this case, energy poverty is conceptualized as a multi-dimensional concept, encompassing both availability (access) and affordability issues.
Methodology

[1]Under the Capability Approach (Sen, 1993; Nussbaum, 2000), capabilities are the real opportunities people have to live the life they have reasons to value. In this sense, energy poverty interventions should be oriented to expand people's capabilities, which are currently limited by domestic energy deprivation.

Measuring Multi-dimensional Energy Poverty Index (MEPI)

Following other studies that examined multi-dimensional energy poverty (Nussbaumer et al., 2012; Okushima, 2017; Adusha-Poku & Takeuchi, 2019; Mendoza et al., 2019), we employed the AF methodology (Alkire & Foster, 2011a, 2011b) for identification and aggregation. We assume a population of n households i $(i=1,..,n)$ and $d \geq 2$ dimensions $(j=1,..,d)$, summarized by an $n \times d$-dimensional matrix $Y=[y_{ij}]_{(n \times d)}$, where y_{ij} is a set of achievements of household i in indicator j. The AF methodology uses a two-step 'dual cut-off' process to identify the poor (Alkire & Foster, 2011a, 2011b).

The first cut-off process is linked to deprivation cut-offs for each indicator, xi. It is denoted by z_j represented by a vector $z=(z_1,z_2..,z_d)$ where d represents the number of indicators. A household i is deprived in an indicator j if its achievement falls below the deprivation cut-off z_j (or $y_{ij}<z_j$) for indicator j. From the Y matrix and z vector, a matrix of deprivation $g_{ij}=[g_{ij}]_(n \times d)$ is obtained such that $g_{ij}=1$ when $y_{ij}<z_j$ and g_ij=0 otherwise. In other words, $g_{ij}=1$ means household i is poor (or deprived) in indicator j. Next, let $w=(w_1,w_2,w_d)$ be the vector of indicators' weights. The weight attached to indicator j is denoted by w_j such that $(w\_j>0)$. These weights sum to 1, that is, $\sum_j^d=1)\wedge dw_j=1$ and $w_j[0,1]$. Then, the deprivation score c_i is computed for each household i, such that $c_i=\sum_j^d=1=w_j g_{ij}$. If a household is not deprived in any indicator, c_i=0, and if a household is deprived in all indicators, c_i=1. The vector of deprivations for all households is given by $c=(c_1,c_2..,c_n)$.

The second step involves choosing the poverty cut-off point, k, using the deprivation profiles in all indicators of multi-dimensionally energy poor households. The choice of k is such that $1 \leq k \leq d$. [2]The poverty cut-off is implemented by using the method of identification ^Pk. A household i is identified as multi-dimensional energy poor if it satisfies the following condition: $^Pk\ (x\_i;z)=1$ *if* $ci \geq k$; otherwise, household i is not in energy poverty if $^Pk\ (y\_i;z)=0$. From the deprivation matrix $g[g_{ij}]_{(n \times d)}$, a censored deprivation matrix $g(k)$ is constructed by multiplying each element in g by the identification function $^Pk\ (y\_i;z):g\_ij\ (k)=^Pk\ (y\_i;z):g\_ij \times ^Pk\ (y\_i;z)$ for all i and all j. A censored deprivation score vector for all individuals is then obtained from the original deprivation score vector: $c(k)=c \times ^Pk\ (y\_i;z)$. *Let* $c(k)=\sum\_(j=1)\wedge dw\_j\ g\_ij\ (k)$ be the censored deprivation score of household i; by definition $c_i\ (k)=c_i$, *if* $c_i \geq k$ *and* $c_i\ (k)=0$, *if* $c\_i<k$ (Alkire & Santos, 2014). [3]Then, $c(k)=[c_1\ (k),c_2\ (k)...,c_n\ (k)]$. Finally, we can now compute a multi-dimensional energy poverty index (MEPI) as:

$$M_0 = H \times A = \frac{q}{n} \times \frac{1}{q} \sum_{i=1}^{q} c_i\,(k) = \frac{1}{n} \sum_{i=1}^{n} c_i\,(k) \qquad (1)$$

where q is the number of multi-dimensionally energy poor households, n is the number of households in the population; $c(k)$ is the censored deprivation score of household i. M_0 is the adjusted energy headcount ratio, containing both multi-dimensional energy headcount ratios (H) and the average deprivation scores, capturing the intensity of multi-dimensional energy poverty (A) (Alkire et al., 2015).

[2] k represents the share of weighted deprivations a household must experience to be considered multi-dimensionally energy poor. That is, to be identified as multi-dimensionally energy poor, a household's deprivation score must be equal to or larger than the poverty cut-off (ci ≥ k). We utilise the 'acute' poverty cut-off (k=1/3) (Nussbaumer et al., 2012).

[3]k represents the share of weighted deprivations a household must experience to be considered multi-dimensionally energy poor. That is, to be identified as multi-dimensionally energy poor, a household's deprivation score must be equal to or larger than the poverty cut-off (ci ≥ k). We utilise the 'acute' poverty cut-off (k=1/3) (Nussbaumer et al., 2012).

Selection of dimensions and deprivation indicators

Table 1 presents the dimensions and indicators used to compute multi-dimensional energy poverty for Botswana, including their respective cut-offs and weights. Following other studies, the weights are distributed arbitrarily among the indicators, recognizing their relative importance to the overall MEPI (Nussbaumer et al., 2012; Crentsil et al., 2019; Mendoza et al., 2019). We included five (5) dimensions comprising six (indicators). The cooking dimension comprises two indicators: pollution and modern cooking fuel. Cooking fuel captures the source of fuel used by households for cooking. Using dirty fuel for cooking is associated with indoor air pollution, which has adverse effects on individuals' health and might increase the risk of many diseases and death (Kaplan, 2010; Balakrishnan et al., 2011; Lacey et al., 2017). This captures the capability of good health (Day et al., 2016). Being unhealthy can also affect several other basic capabilities, such as an individual's capability to take part in social activities and undertake paid employment (Rippin, 2016). A household is deprived of cooking fuel if the primary source of cooking is wood, cow dung, coal, charcoal, and crop waste or has no source of cooking fuel at all. Concerning indoor air pollution, a household is deprived if there is no separate room or space for cooking or cooks with dirty fuel in a closed area.

Access to electricity is vital for essential household services (Crentsil et al., 2019). Access to electricity can improve the living conditions of households by allowing them to be somewhat independent of sunlight and contribute to a clean environment (Santos, 2013). Access to electricity is also critical for other capabilities, such as information, education, entertainment, and communication (Day et al., 2016; Sadath & Acharya, 2017). For example, using electricity for lighting aids the use of modern technologies, thereby enhancing learning for children. Also, the availability of lighting allows adults, especially women, to study during the night after completing their house chores (Wamukonya & Davis, 2001). A household is considered deprived if the primary source of lighting in the household is not electricity from the national grid.

In addition to access to electricity and improved cooking fuels, we included three indicators that capture what Day et al. (2016) termed secondary capabilities. Nussbaumer et al. (2012) argued that the MEPI should include other indicators that capture the issue of energy affordability by incorporating indicators that relate to the ownership of household appliances. We include three indicators. The first indicator captures services provided by means of household appliances defined in terms of household ownership of fridge/freezer. A household is defined as deprived on this indicator if the household does not own a refrigerator or freezer. The second indicator relates to entertainment/education. A household is considered deprived in this indicator if it does not own a radio or television. The third indicator is communication; a household is deemed deprived in telecommunications if it does not own a fixed telephone or mobile phone. These indicators influence some basic capabilities, such as education and access to information

TABLE 1: Dimensions, deprivation indicators, cut-offs, and weights

DIMENSION	INDICATOR	INDICATOR DEFINITION	DEPRIVATION CUT-OFF (A HOUSEHOLD IS DEPRIVED IF ...)	WEIGHT
1. LIGHTING	**Electricity access**	Assess household connectivity to the national grid	The household is not connected to the national grid.	1/5
	Pollution	Captures indoor air pollution	There is no separate room or space for cooking or cooks with dirty fuel in a closed area.	1/5
2. COOKING	**Modern cooking fuel**	Captures the source of fuel for cooking used by households	The household uses the following fuel sources: wood, cow dung, coal, charcoal, and crop waste OR has no source of cooking fuel at all.	1/5
3. SERVICES PROVIDED BY MEANS OF HOUSEHOLD APPLIANCES	**Household appliance ownership**	Assess whether the household owns a fridge	The household does not own a fridge	2/15
4. ENTERTAINMENT/ EDUCATION	**Entertainment education appliances**	Assesses whether the household owns a radio OR television	The household does not own a radio OR television.	2/15
5. COMMUNICATION	**Telecommunication means**	Assesses ownership of communication appliances	The household does not own a landline OR mobile phone.	2/15

SOURCE: Nussbaumer et al. (2012); Crentsil et al. (2019); Mendoza et al. (2019

Findings and Discussions

Energy deprivation indicators

Before aggregating the results into a single multi-dimensional energy poverty index (MEPI), we examined the unidimensional results for each deprivation indicator. **Figure 1** presents 'the uncensored headcount ratio', that is, the estimated proportion of households deprived in each of the six (6) indicators used. As seen from **Figure 1**, most households are deprived in services provided by means of household appliances (37.1%) followed by cooking fuel (31.8%) and access to electricity (lighting). Concerning entertainment or education appliances, 23.5% of households are deprived, while 13.5% of households are exposed to indoor air pollution due to the use of dirty fuel in a closed space. **Table 2** presents the indicator deprivation levels across districts. The results reveal significant differences in deprivation levels across districts, with Kweneng West, Ngwaketse West and Ngamiland West (except for CKGR and Delta) experiencing higher deprivation incidences than other districts.

FIGURE 1: PERCENTAGE OF HOUSEHOLDS DEPRIVED IN EACH INDICATOR 2022

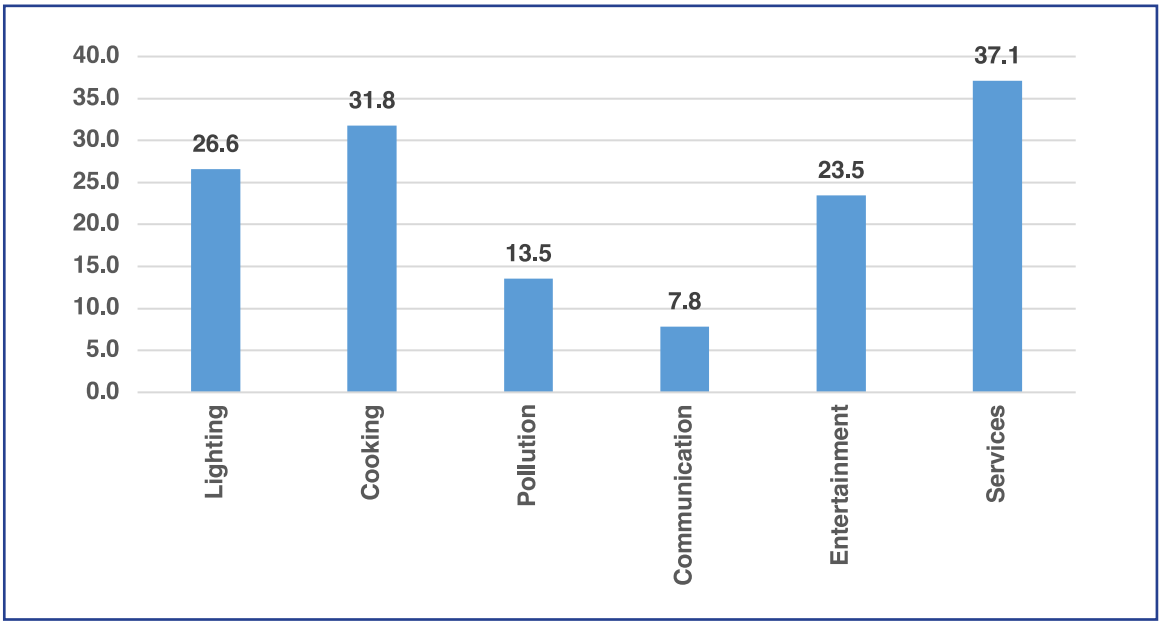

TABLE 2: Percentage Of Households Deprived In Each Indicator By Districts 2022

DISTRICTS	LIGHTING	COOKING	POLLUTION	COMMUNICATION	ENTERTAINMENT	SERVICES
Gaborone	6.9	2.3	1.3	4.7	16.8	20.1
Francistown	10.0	7.8	3.8	4.1	14.2	21.7
Lobatse	19.0	6.5	3.0	5.3	20.7	30.3
Selibe Phikwe	10.5	10.9	5.1	4.6	13.2	21.3
Orapa	0.7	1.0	0.9	3.8	16.4	21.4
Jwaneng	8.8	1.7	0.6	3.6	16.8	20.6
Sowa	0.1	2.5	2.4	5.2	8.4	9.0
Southern	34.0	38.2	18.6	8.7	25.5	43.7
Barolong	42.8	53.1	29.7	8.9	29.2	49.6
Ngwaketse West	65.1	73.0	24.0	11.5	44.4	70.4
South East	9.2	8.7	3.9	4.1	18.4	21.9
Kweneng East	20.4	19.8	9.4	8.2	20.5	33.3
Kweneng West	65.4	73.9	28.0	12.8	45.9	72.2
Kgatleng	24.8	27.1	13.0	6.9	19.5	34.1
Central Serowe/Palapye	30.8	42.1	19.0	8.9	23.4	40.5
Central Mahalapye	38.9	51.8	19.9	9.7	27.3	49.0
Central Bobonong	36.1	54.6	26.4	6.6	25.2	43.6
Central Boteti	36.8	41.8	16.2	10.6	27.1	45.7
Central Tutume	35.7	56.3	26.3	10.3	27.1	46.1
North East	19.8	41.4	22.0	6.1	18.4	30.0
Ngamiland East	30.7	38.8	10.4	7.9	25.0	40.3
Ngamiland West	58.5	71.4	16.6	11.7	43.7	66.0
Chobe	19.7	26.8	9.3	7.4	20.3	28.8
Delta	100.0	96.8	28.9	21.6	52.6	91.6
Ghanzi	46.9	46.0	14.0	14.0	33.8	51.6
CKGR	100.0	88.1	7.1	53.6	51.2	90.5
Kgalagadi South	43.0	49.6	24.6	10.0	35.5	51.4
Kgalagadi North	39.1	44.9	18.1	9.9	36.4	47.7
TOTAL	**26.6**	**31.8**	**13.5**	**7.8**	**23.5**	**37.1**

Multi-dimensional energy poverty index

Table 3 presents multi-dimensional energy poverty levels comprising, the incidence of multi-dimensional energy poverty (multi-dimensional headcount ratio) (H), the intensity of multi-dimensional energy poverty (A), and the multi-dimensional adjusted headcount ratio (M_0). The results reveal that 34.7% of the households in Botswana are multi-dimensionally energy poor. This means that 241,591 out of the 697,126 households are multi-dimensionally energy poor[4]. The intensity of multi-dimensional energy poverty is estimated at 0.591, meaning, on average, the multi-dimensional energy poor households are simultaneously deprived in 59.1% of the indicators considered. The adjusted headcount ratio is estimated at 0.205. These results show that multi-dimensional energy poverty in Botswana remains a challenge.

To identify where those who are multi-dimensionally energy poor live, we examined the results across census districts. According to **Table 2**, the results reveal that except for the Delta and CKGR, Kweneng West (77%), Ngwaketse West (75.3%) and Ngamiland West (68.9%) experienced the highest incidences of multi-dimensional energy poverty. The same picture is observed based on the intensity of multi-dimensional energy poverty and MEPI. In contrast, Sowa Town and Orapa experienced the lowest levels of multi-dimensional energy poverty. These two districts are mining towns with good infrastructure, and access to essential services such as water, electricity and health are freely provided. Generally, the incidence of multi-dimensional energy poverty is highest in the western regions of Botswana and is lowest in the eastern part of the country **(Figure 4)**. This pattern is comparable with income poverty (Statistics Botswana, 2018). The western regions are less urbanised and have lower average incomes than the eastern regions. The same conclusion is reached regarding the intensity of multi-dimensional energy poverty **(Figure 5)** and the multi-dimensional adjusted headcount ratio **(Figure 6)**.

[4]119 households had missing information and were excluded from the analysis. Hence, there are 697,126 instead of 697,245 households.

TABLE 3: Multi-dimensional energy poverty levels across districts 2022

DISTRICTS	INCIDENCE (H)	INTENSITY (A)	MEPI (M0)
Gaborone	8.3	0.462	0.038
Francistown	12.6	0.505	0.064
Lobatse	19.8	0.495	0.098
Selibe Phikwe	14.3	0.529	0.076
Orapa	3.1	0.432	0.013
Jwaneng	9.1	0.457	0.042
Sowa	2.7	0.453	0.012
Southern	43.6	0.598	0.261
Barolong	57.3	0.608	0.348
Ngwaketse West	75.3	0.634	0.477
South East	12.0	0.539	0.065
Kweneng East	25.8	0.570	0.147
Kweneng West	77.0	0.644	0.496
Kgatleng	31.2	0.587	0.183
Central Serowe/Palapye	42.1	0.604	0.254
Central Mahalapye	52.1	0.598	0.312
Central Bobonong	52.4	0.592	0.310
Central Boteti	43.5	0.624	0.272
Central Tutume	54.1	0.594	0.321
North East	37.9	0.549	0.208
Ngamiland East	38.6	0.583	0.225
Ngamiland West	68.9	0.626	0.431
Chobe	27.2	0.547	0.149
Delta	98.9	0.678	0.671
Ghanzi	50.6	0.631	0.319
CKGR	90.5	0.698	0.632
Kgalagadi South	53.8	0.633	0.341
Kgalagadi North	48.7	0.614	0.299
TOTAL	**34.7**	**0.591**	**0.205**

Robustness analysis

A multi-dimensional measure is designed based on a choice of diverse parameters (Alkire et al., 2015). Therefore, there is a need to assess how sensitive the estimates are to the selection of different parameters and if the main conclusions are robust to the different choices of parameters. Therefore, this section examines whether the main conclusions are robust to (i) different poverty cut-offs (k values) and (ii) changes in weighting structure (w). First, the robustness analysis involved computing poverty headcount ratios (H), intensity (A) and adjusted headcount ratio (M_0), considering two different poverty cut-offs (k=0.25 and k=0.40).[5]

The results show that no matter which value of k is chosen, the rankings of the districts remained unaltered. Except for CKGR and the Delta, Kweneng West, Ngwaketse West, and Ngamiland West remained the poorest districts (except for Delta and CKGR), while in contrast, Sowa remained the least energy-poor district **(Table 4)**. Second, we employed alternative weighting schemes. In this case, the equal weighting scheme

[5]The values of k are limited to a more plausible range of 25% to 40% to conduct restricted dominance tests (Alkire & Santos, 2014).

is employed across all indicators. The main conclusions remain robust, with Kweneng West, Ngwaketse West and Ngamiland West experiencing higher poverty levels. In contrast, Sowa remained the least energy poor district **(Table 4)**. The robustness analysis proves that even though normative decisions were employed when constructing MEPI, the public policy conclusions drawn from the index are robust to a choice of diverse parameters.

TABLE 4: Robustness analysis 2022

	K=0.25			K=0.40			EQUAL WEIGHTS		
DISTRICTS	H	A	M	H	A	M	H	A	M
Gaborone	15.5	0.371	0.058	6.7	0.494	0.033	15.5	0.414	0.064
Francistown	17.8	0.436	0.078	10.1	0.549	0.055	17.8	0.452	0.080
Lobatse	25.2	0.446	0.112	15.2	0.543	0.083	25.2	0.470	0.118
Selibe Phikwe	18.3	0.472	0.086	12.2	0.562	0.069	18.3	0.479	0.087
Orapa	16.4	0.297	0.049	3.0	0.436	0.013	16.4	0.361	0.059
Jwaneng	16.4	0.372	0.061	7.0	0.493	0.035	16.4	0.415	0.068
Sowa	7.6	0.333	0.025	2.6	0.457	0.012	7.6	0.363	0.028
Southern	47.2	0.573	0.270	40.8	0.616	0.251	47.2	0.559	0.264
Barolong	59.8	0.594	0.355	54.4	0.623	0.339	59.8	0.571	0.341
Ngwaketse West	76.9	0.626	0.482	72.8	0.644	0.469	76.9	0.610	0.469
South East	18.9	0.440	0.083	10.6	0.567	0.060	18.9	0.458	0.086
Kweneng East	31.1	0.518	0.161	23.2	0.595	0.138	31.1	0.520	0.162
Kweneng West	78.8	0.635	0.500	74.5	0.654	0.487	78.8	0.619	0.488
Kgatleng	35.2	0.551	0.194	28.9	0.608	0.176	35.2	0.539	0.190
Central Serowe/Palapye	45.3	0.580	0.263	39.3	0.623	0.245	45.3	0.563	0.255
Central Mahalapye	54.7	0.582	0.318	48.6	0.617	0.300	54.7	0.566	0.309
Central Bobonong	54.7	0.578	0.316	49.2	0.608	0.299	54.7	0.552	0.302
Central Boteti	47.3	0.595	0.282	40.3	0.647	0.261	47.3	0.585	0.277
Central Tutume	56.7	0.579	0.328	50.7	0.611	0.310	56.7	0.558	0.317
North East	41.0	0.528	0.216	34.9	0.568	0.198	41.0	0.504	0.207
Ngamiland East	42.5	0.553	0.235	35.5	0.604	0.215	42.5	0.545	0.232
Ngamiland West	71.1	0.615	0.437	64.7	0.645	0.417	71.1	0.604	0.429
Chobe	31.9	0.505	0.161	24.7	0.569	0.140	31.9	0.501	0.160
Delta	98.9	0.678	0.671	98.4	0.680	0.669	98.9	0.658	0.651
Ghanzi	54.1	0.608	0.329	48.1	0.647	0.311	54.1	0.600	0.325
CKGR	90.5	0.698	0.632	90.5	0.698	0.632	90.5	0.702	0.635
Kgalagadi South	57.2	0.611	0.350	51.3	0.648	0.332	57.2	0.596	0.341
Kgalagadi North	53.3	0.584	0.311	45.9	0.630	0.290	53.3	0.575	0.307
TOTAL	**39.0**	**0.555**	**0.216**	**32.0**	**0.612**	**0.196**	**39.0**	**0.546**	**0.213**

Policy implications

Conceptualizing MEPI within the CA framework in Botswana yielded several significant policy implications. First, identifying specific dimensions/indicators of energy poverty across districts helps policymakers implement targeted interventions that address the specific needs of different households, taking into consideration the districts' heterogeneous nature.

Second, Conceptualizing MEPI within the CA helps policymakers adopt a more holistic approach to energy poverty that considers not only access to energy but also its impact on people's ability to lead dignified and fulfilling lives

Third, MEPI can help policymakers tailor energy policies and programmes to the diverse needs and preferences of different communities across districts. For example, the finding that Districts such as Kweneng West, Ngwaketse West, and Ngamiland West had higher multi-dimensional energy poverty levels means that government interventions should have specific interventions geared towards addressing the needs of these districts. For example, where access to electricity is limited, renewable energy solutions such as solar micro-grids or biogas plants could be prioritized.

Fourth, MEPI helps policymakers identify other forms of deprivation (access to clean water, sanitation, and education) linked with energy poverty, thus promoting cross-sectoral collaboration to address multiple dimensions of poverty simultaneously.

Fifth, the CA emphasizes the importance of empowering individuals to actively participate in decisions that affect their lives. Therefore, there is a need to involve energy poor communities in designing and implementing energy policies and programmes to ensure that they are inclusive (culturally appropriate, socially acceptable), and sustainable.

Overall, using MEPI within the capability approach framework can help policymakers adopt a more nuanced understanding of energy poverty and design more effective and sustainable interventions to address it.

Conclusions and Recommendations

Access to sustainable energy for all is embedded in the 2030 Agenda for Sustainable Development. Specifically, SDG 7 aims to ensure universal access to affordable, reliable, sustainable, and modern energy by the year 2030. The issue of energy is also recognized by the Agenda 2063 as a critical commodity for African households. Even with this, access to modern energy is a huge challenge in most Sub-Saharan African (SSA) countries, with most people needing access to clean energy. Most of these people live in rural areas and low-income households. Despite this, studies dealing with energy poverty in SSA remain scarce.

The Government of Botswana strives to expand access to sustainable renewable energy and has implemented several interventions to increase the adoption and use of modern and clean energy. However, despite these interventions, Botswana continues to experience energy shortages affecting many households. The use of renewable energy remains well below the country's potential. Considering this, it is essential to investigate the situation of energy poverty in Botswana. Understanding energy poverty is critical since it has a bearing on how it is defined and measured, which in turn influences interventions to alleviate it.

Therefore, the main aim of this study is to construct the multi-dimensional energy poverty index (MEPI) to investigate the level and extent of energy poverty across districts in Botswana. Our MEPI accounts for five (5) dimensions comprising six (6) energy deprivation indicators. We employed the framework of capability approach to conceptualize energy poverty. In this case, energy poverty is conceptualized as a multi-dimensional concept. For aggregation, we used the Alkire-Foster (AF) methodology. To our knowledge, no study has examined multi-dimensional energy poverty in Botswana. Thus, this study provides the first attempt and contributes to the literature.

The unidimensional results reveal that most households are deprived in services provided by means of household appliances (37.1%) followed by cooking fuel (31.8%) and access to electricity (lighting). Concerning entertainment or education appliances, 23.5% of households are deprived, while 13.5% of households are exposed to indoor air pollution due to the use of dirty fuel in a closed space. The deprivation levels differ significantly across districts, with Kweneng West, Ngwaketse West and Ngamiland West recording higher deprivation rates. The results reveal that 34.7% of the households in Botswana are considered multi-dimensionally energy poor. The intensity of multi-dimensional energy poverty is estimated at 0.591, meaning, on average, the multi-dimensional energy poor households are simultaneously deprived in 59.1% of the indicators considered. The adjusted headcount ratio is estimated at 0.205. These results show that multi-dimensional energy poverty in Botswana remains a challenge.

The results further reveal that except for the Delta and CKGR, Kweneng West (77%), Ngwaketse West (75.3%) and Ngamiland West (68.9%) experienced the highest incidences of multi-dimensional energy poverty. The same picture is observed based on the intensity of multi-dimensional energy poverty and MEPI. In contrast, Sowa Town and Orapa experienced the lowest levels of multi-dimensional energy poverty. These two districts are mining towns with good infrastructure, and access to essential services such as water, electricity and health are freely provided. The robustness analysis proves that even though normative decisions were employed when constructing MEPI, the public policy conclusions drawn from the index are robust to a choice of diverse parameters. Finally, this new measure, MEPI, and its findings have implications for future policy interventions to tackle energy poverty in Botswana.

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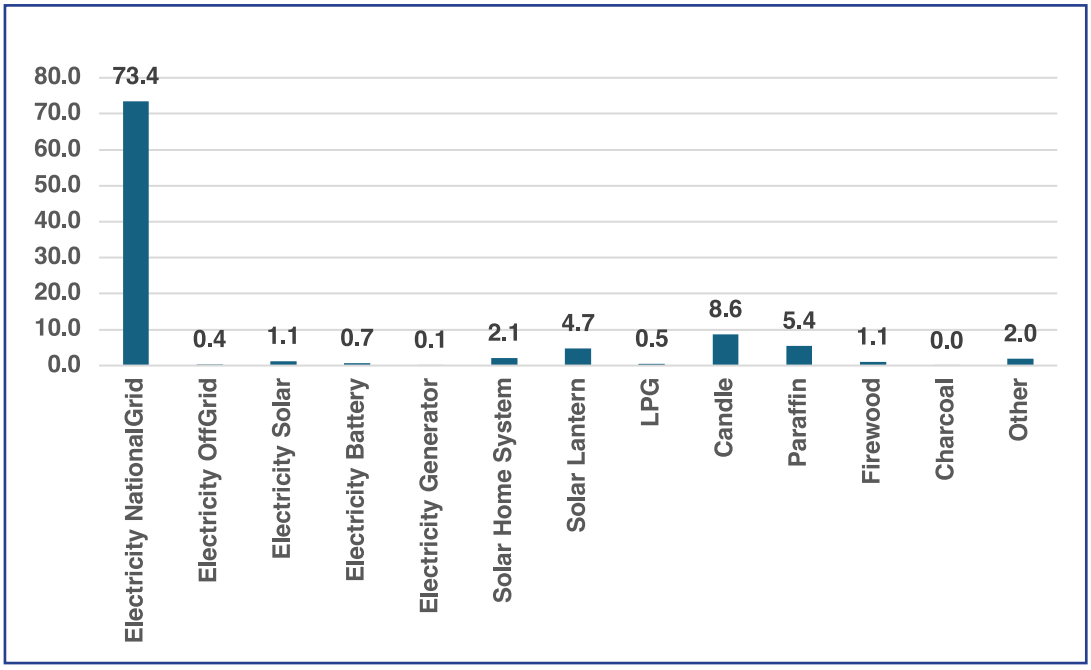
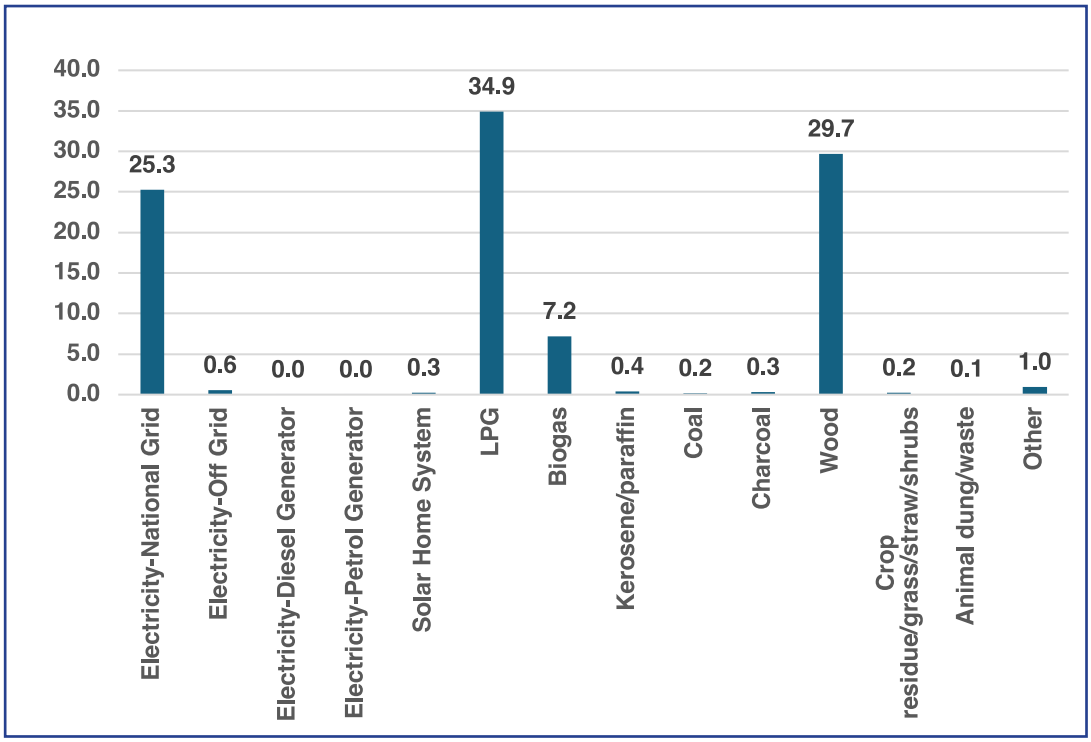
APPENDICES

APPENDIX 1: PRINCIPAL SOURCE OF ENERGY FOR LIGHTING 2022



APPENDIX 2: PRINCIPAL SOURCE OF ENERGY FOR COOKING 2022



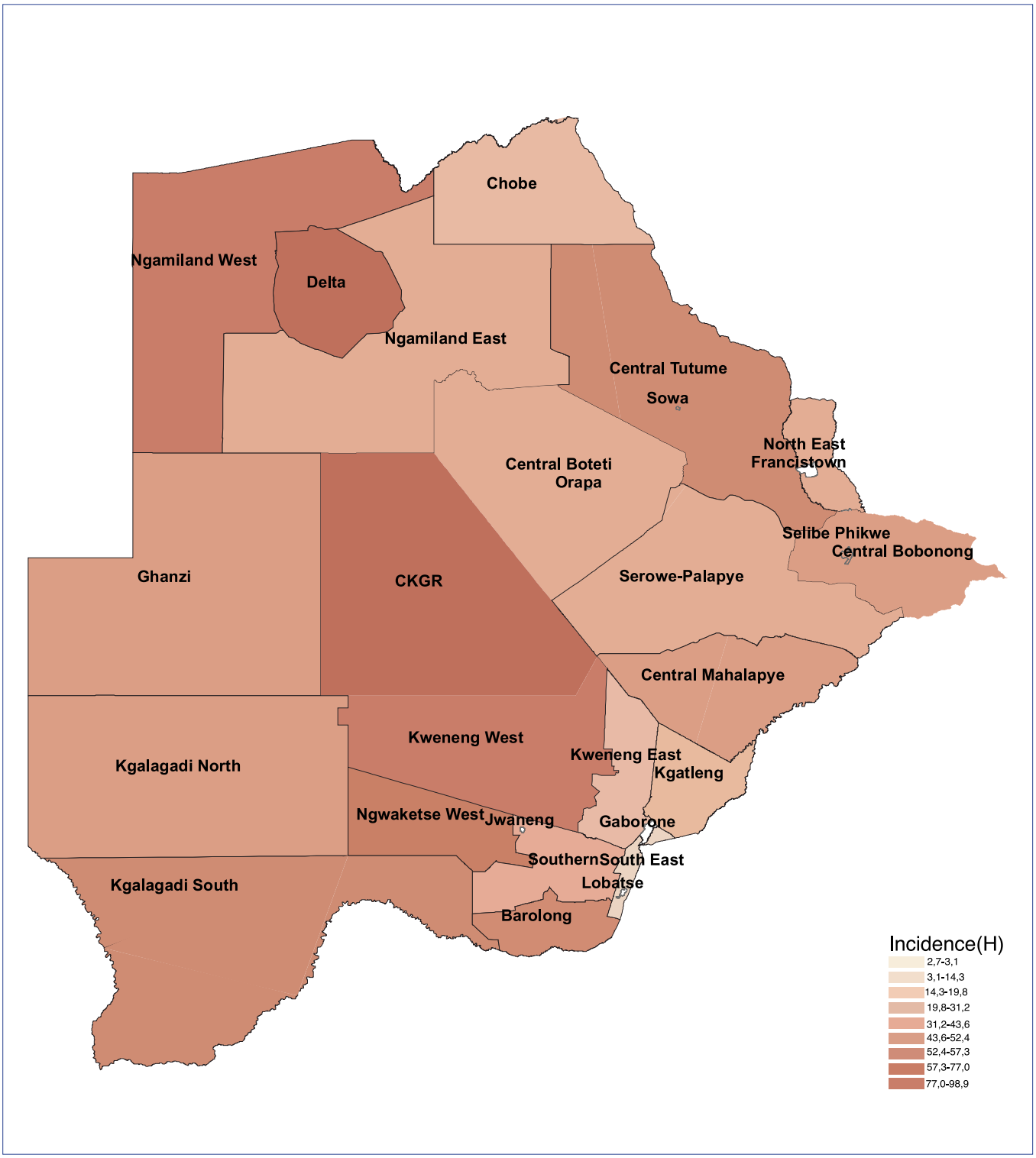
APPENDIX 3: Number of households deprived in each indicator across districts 2022

DISTRICTS	LIGHTING	COOKING	POLLUTION	COMMUNICATION	ENTERTAINMENT	SERVICES	TOTAL
Gaborone	5,714	1,924	1,032	3,897	13,828	16,550	**82,410**
Francistown	3,395	2,632	1,284	1,371	4,815	7,327	**33,809**
Lobatse	1,868	637	300	522	2,034	2,984	**9,839**
Selibe Phikwe	1,404	1,458	681	610	1,765	2,837	**13,328**
Orapa	21	29	28	117	500	651	**3,047**
Jwaneng	580	114	39	234	1,104	1,358	**6,585**
Sowa	1	28	26	58	93	99	**1,106**
Southern	12,843	14,438	7,029	3,303	9,631	16,523	**37,806**
Barolong	7,063	8,758	4,907	1,468	4,811	8,188	**16,498**
Ngwaketse West	4,292	4,808	1,582	756	2,923	4,636	**6,588**
South East	3,343	3,178	1,421	1,474	6,696	7,948	**36,324**
Kweneng East	20,496	19,950	9,480	8,286	20,612	33,518	**10,0716**
Kweneng West	10,413	11,770	4,458	2,041	7,305	11,488	**15,920**
Kgatleng	9,079	9,886	4,768	2,517	7,113	12,459	**36,537**
Central Serowe/Palapye	17,534	23,997	10,841	5,098	13,328	23,060	**56,983**
Central Mahalapye	14,268	19,018	7,285	3,550	10,014	17,961	**36,681**
Central Bobonong	8,013	12,131	5,860	1,457	5,605	9,678	**22,211**
Central Boteti	7,824	8,884	3,442	22,46	5,751	9,720	**21,258**
Central Tutume	16,651	26,259	12,271	4,797	12,628	21,473	**46,626**
North East	4,146	8,657	4,610	1,277	3,844	6,272	**20,910**
Ngamiland East	9,688	12,244	3,271	2,501	7,900	12,737	**31,576**
Ngamiland West	10,478	12,795	2,968	2,097	7,831	11,822	**17,921**
Chobe	1,991	2,718	945	752	2,058	2,911	**10,123**
Delta	190	184	55	41	100	174	**190**
Ghanzi	7,099	6,958	2,122	2,112	5,116	7,810	**15,137**
CKGR	84	74	6	45	43	76	**84**
Kgalagadi South	4,190	4,834	2,400	975	3,457	5,012	**97,44**
Kgalagadi North	2,801	3,218	1,296	713	2,609	3,417	**7,169**
Total	**185,469**	**221,581**	**94,407**	**54,315**	**163,514**	**258,689**	**697,126**

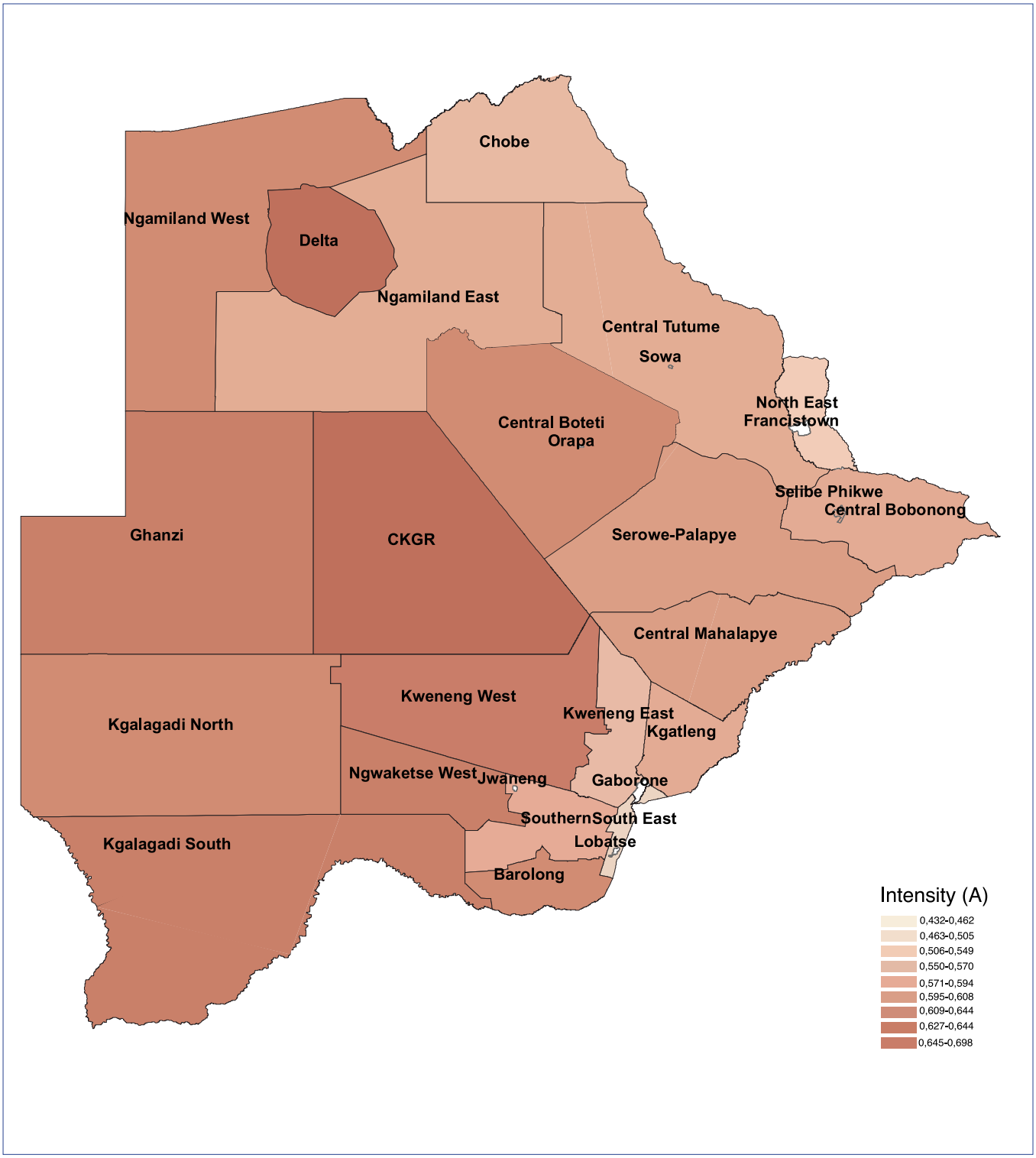
APPENDIX 4: Number of households by poverty status across districts 2022

DISTRICTS	NON-POOR	POOR	TOTAL
Gaborone	75,575	6,835	**82,410**
Francistown	29,545	4,264	**33,809**
Lobatse	7,892	1,947	**9,839**
Selibe Phikwe	11,423	1,905	**13,328**
Orapa	2,954	93	**3,047**
Jwaneng	5,987	598	**6,585**
Sowa	1,076	30	**1,106**
Southern	21,321	16,485	**37,806**
Barolong	7,051	9,447	**16,498**
Ngwaketse West	1,628	4,960	**6,588**
South East	31,970	4,354	**36,324**
Kweneng East	74,778	25,938	**100,716**
Kweneng West	3,666	12,254	**15,920**
Kgatleng	25,128	11,409	**36,537**
Central Serowe/Palapye	33,012	23,971	**56,983**
Central Mahalapye	17,575	19,106	**36,681**
Central Bobonong	10,576	11,635	**22,211**
Central Boteti	12,003	9,255	**21,258**
Central Tutume	21,416	25,210	**46,626**
North East	12,987	7,923	**20,910**
Ngamiland East	19,378	12,198	**31,576**
Ngamiland West	5,565	12,356	**17,921**
Chobe	7,366	2,757	**10,123**
Delta	2	188	**190**
Ghanzi	7,476	7,661	**15,137**
CKGR	8	76	**84**
Kgalagadi South	4,500	5,244	**9,744**
Kgalagadi North	3,677	3,492	**7,169**
TOTAL	**455,535**	**241,591**	**697,126**

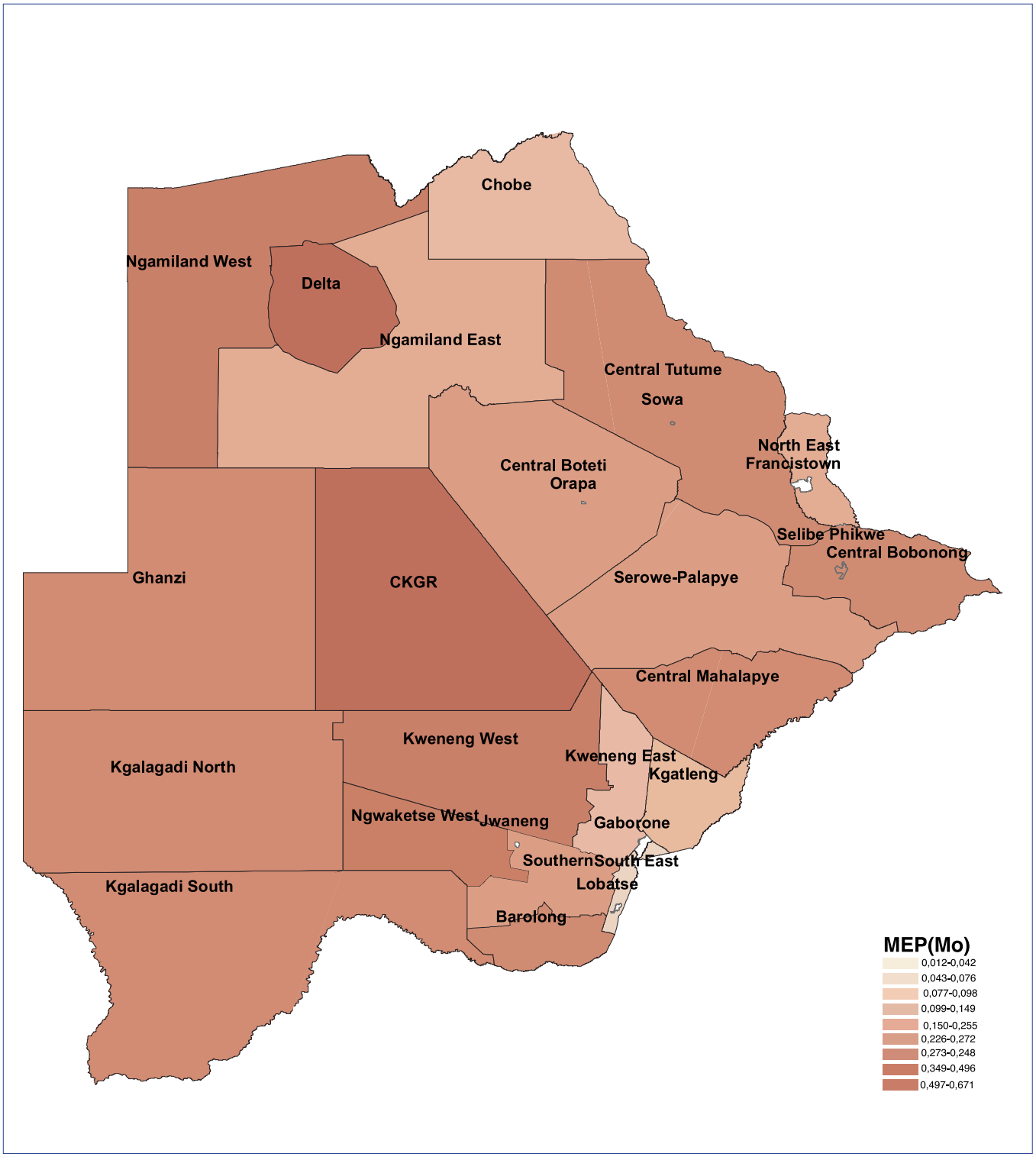
APPENDIX 5: The incidence of multi-dimensional energy poverty 2022

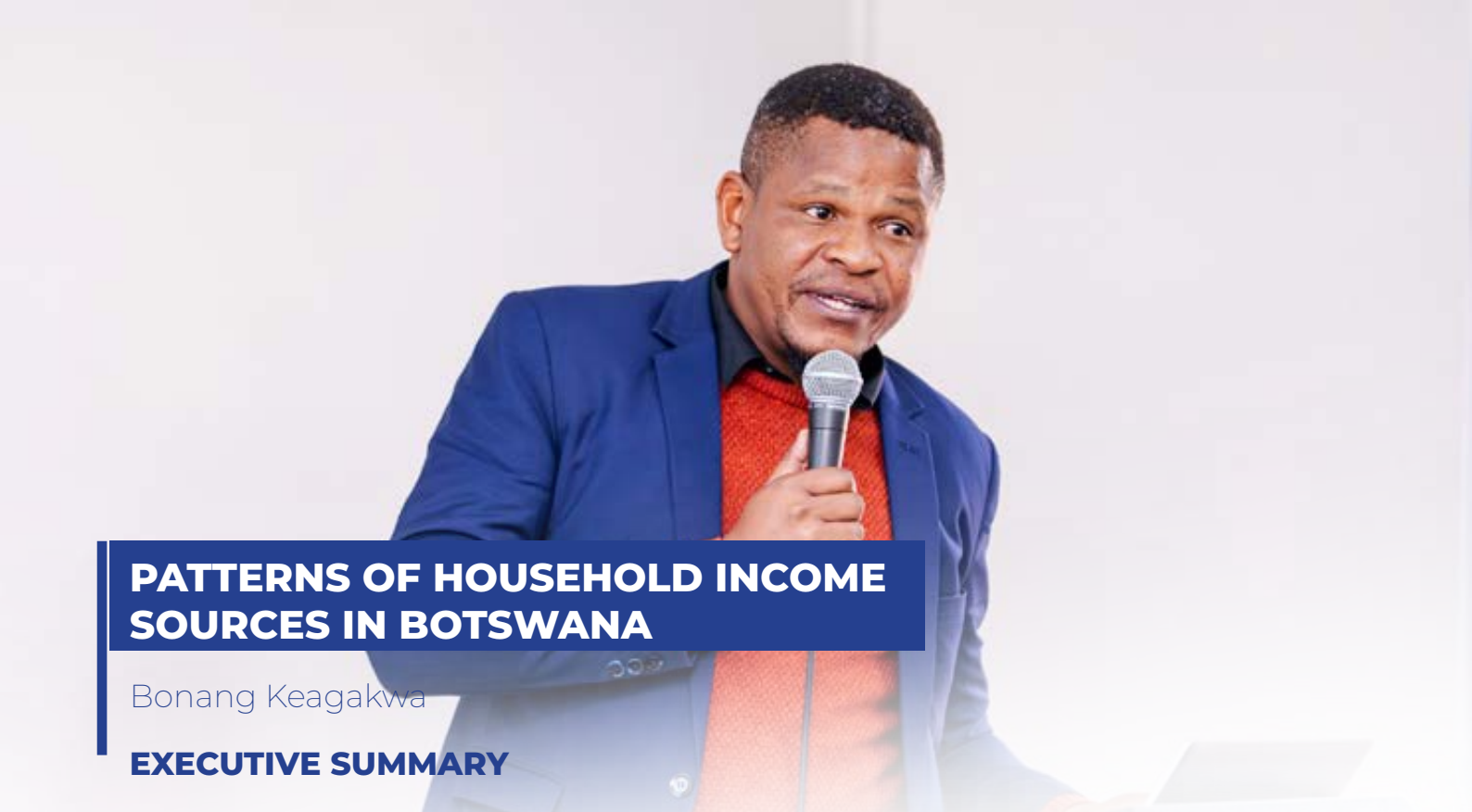


APPENDIX 6: The intensity of multi-dimensional energy poverty 2022



APPENDIX 7: The multi-dimensional adjusted headcount ratio 2022





PATTERNS OF HOUSEHOLD INCOME SOURCES IN BOTSWANA

Bonang Keagakwa

EXECUTIVE SUMMARY

Household income sources are crucial to Botswana's complementary dual goals of reducing poverty and enhancing resilience to the impacts of climate change. The first Sustainable Development Goal (SDG), which seeks to eradicate poverty in all its forms globally, identifies the importance of reducing exposure and vulnerability to climate shocks as a key strategy for strengthening poverty resilience.

Botswana has experienced long periods of economic growth since discovery of diamonds. The growth inspired diversification of household income sources from reliance in subsistence agriculture for livelihoods and enabled exploitation of opportunities in employment and businesses. Consequently, poverty level has been continuously declining since 1985/86.

While poverty incidence is declining, it continues to be more concentrated in rural areas. Slowing economic growth rate coupled limited economic diversification has yielded limited opportunities to be exploited in order for rural households to diversify their income sources from agricultural activities. Furthermore, some households continues to be faced with capacity challenges such as education and skills to explore available opportunities. This necessitates the need to explore patterns of income sources in order strengthen evidence for policies that attempt to encourage household to diversification their income sources. The aim of this study is to establish household income sources distribution by sex of household head, education of household head, marital status of household head, locality type.

Data from the 2022 Population & Housing Census (PHC) conducted in March-April 2022, was analysed in SPSS. Multiple response set was defined in SPSS using all the polytomous variables under agricultural activity, household activities and other cash/in-kind. A multiple response frequency and cross tabulations was then produced.

Other cash/in kind receipts is reported by 88.0% of households while agricultural activities and household activities were reported by 17.1% and 13.0%, respectively, as their income source. About a tenth (9.7%) of households reported that they have no income source. Other cash/in kind income sources is predominantly reported by households in urban areas, headed by persons whose highest education is tertiary. Conversely, agricultural activities income sources are more common among households in rural areas, headed by males and also headed by persons who have no educational background. Likewise, household activities are reported mainly by households in rural areas and headed by persons who has never attended school. Female head households and households from the Delta district were found to constitute the majority of households sourcing income from household activities. Furthermore, household reporting no income source were higher in rural areas, among female headed households and households headed by a person who has never attended school.

The study recommends promotion of business investment, fostering community inclusion, enhancing education and training, prioritising income-less households, and develop alternative income sources in rural areas.

INTRODUCTION

Since gaining independence in 1966, Botswana has enjoyed prolonged periods of economic growth driven by its diamond-dominated mining sector. Prudent macroeconomic policies have been instrumental in avoiding the resource curse that has plagued other resource-rich African nations. This growth has facilitated a diversification in household income sources away from a dependence on agriculture, particularly subsistence farming, towards employment and business opportunities related income sources. Additionally, economic growth has positively impacted the financial sector, providing further opportunities for household income diversification through pensions, credit access, and insurance. Consequently, poverty levels have consistently decreased from 59.0% in 1985/86 to 16.3% in 2015/16. However, despite this overall decline, poverty remains more prevalent in rural areas, with incidence rates of 54.0%, 40.1%, 44.8%, 24.3%, and 24.2% in the years 1985/86, 1993/94, 2002/03, 2009/10, and 2015/16, respectively (Statistics Botswana, 2016; Statistics Botswana, 2018).

However, diversification of household income source from dependence on subsistence agriculture is challenged by inadequate economic growth rates, education level, slow progress in economic diversification and economic shocks such as climate change.

Over the past decade (2014-2023), the average annual economic growth rate of about 3.1 percent falls short of the 6 percent needed for Botswana to reach the goal of high-income status by 2036. This renders the economic growth rate inadequate in generating opportunities that may be exploited by households.

Some households encounter barriers such as insufficient education and skills, which prevent them from exploring and capitalizing on available opportunities to shift or diversify their income sources. Education level also encompasses rightful mind-set.

Economic diversification has progressed slowly due to the ineffectiveness of current economic strategies in meeting diversification objectives (Daniel, 2022; Bank of Botswana, 2024). In 2022, the mining sector continued to dominate, contributing 20% of nominal GDP and approximately 90% of total goods exports (Bank of Botswana, 2024).

Botswana's vulnerability to climate change primarily stems from its semi-arid climate. The semi-arid climate is characterized by frequent climate variability and events such as droughts, floods, and veld fires are prevalent. High poverty levels, especially in rural areas where households rely on climate-sensitive livelihood activities such as collecting veld products, cultivating rain-fed subsistence crops, subsistence livestock production and other natural-resource-based activities, further exacerbate vulnerability. Urban households are also affected by climate change, facing challenges like water shortages and flooding due to poor drainage (Government of Botswana, 2020). Vulnerability is further heightened by household limited access to productive resources like fertile land (United Nations Development Programme, 2019).

Household income sources diversification is crucial to achieving Botswana's goals of poverty reduction and enhancing resilience to climate change impacts. The first Sustainable Development Goal (SDG), which aims to eradicate poverty in all its forms globally, acknowledges that reducing exposure and vulnerability to climate shocks is crucial for building resilience against poverty. To mitigate the adverse effects of climate change and stabilize livelihood systems, particularly in poor rural households where poverty is widespread, households often adopt strategies to diversify their income sources (Wan, Li, Wang, Liu, & Chen, 2016).

Effective income source diversification provides households with multiple streams of income, which may not only increases overall income but also mitigates income flow risks by spreading them across different sources. Thus diversification is increasingly viewed as a strategy to manage economic shocks and reduce vulnerability, particularly in developing countries (Helmy, 2020). Ellis (2008) found that under the precarious conditions typical of rural survival in many low-income countries, diversification has positive attributes for livelihood security that outweigh any potential negative connotations.

It is, therefore, crucial to examine household income source patterns in order to strengthen the evidence base for policies that promote income diversification among households.

In Botswana, household income-related statistics are primarily gathered through household surveys and Population and Housing Censuses (PHC). The surveys assess average monthly income levels and categorize income sources into business profits, cash earnings, unearned cash income, own produce, wages in kind, gifts received, aid, and school meals. Household surveys were conducted in 1993/94, 2002/03, 2009/10, and 2015/16, with the next survey planned for 2024/25. The PHC, on the other hand, records whether a household has received cash from various income sources over a year. The main income source classifications in censuses are agriculture, household activities of selling homemade produce, and other cash or in-kind receipts.

The objectives of this chapter are to:

- **Establish the distribution of household income sources among three categories: agricultural activity, household activity, and other cash/in-kind sources in Botswana.**
- **Determine the percentage distribution of household income sources by the sex of the household head, education level of the household head, marital status of the household head, locality type, and district.**
- **Establish the percentage distribution of different income source combinations by the sex of the household head, education level of the household head, marital status of the household head, and locality type.**

Definition of main concepts

Household: A household consists of one or more persons, related or unrelated, living together "under the same roof" in the same lolwapa/dwelling, eating together "from the same pot" and/or making common provision for food and other living arrangements.

Household Income Source: These are cash/in-kind receipts by any household member(s) in the past 12 months. The categories of the sources are stated in Table 1.

LITERATURE REVIEW

Theoretical Framework

The conceptual framework adopted in this study acknowledges that households possess a portfolio of assets, both tangible (such as cash, land, and physical investments) and intangible (such as skills, governance, and access rights to services like water and electricity). Households decide how to utilize this portfolio to pursue various livelihood strategies. The choice of strategies depends on the household's ability to capitalize on livelihood opportunities, which in turn is influenced by the household's composition (Chambers, 1989; Chambers and Conway, 1992). The strategies adopted may aim at coping with and recovering from stress and shocks by stinting, hoarding, protecting, depleting, or diversifying the portfolio; maintaining or enhancing capabilities and assets; and providing sustainable livelihood opportunities for the next generation.

Empirical Literature

Kamaldeen, Evans, Moses, Hanson & Isaac (2021) revealed that smallholder farming households that practiced only farm diversification and a combination of both farm and nonfarm diversification had significantly higher odds of reporting stronger resilience to climate change compared to those who did not employ any diversification strategy. Similarly, Musyoka and Onjala (2023) found that households with a higher livelihood diversification index were less likely to be vulnerable to climate shocks.

Abebe, Chalchisa, and Eneyew (2021) determined that household participation in livelihood diversification has a positive and significant impact on household poverty, with diversified households being better off than those that were not diversified. However, Ebenezer and Abbyssinia (2018) findings revealed that diversification was not significant in influencing household poverty in the Eastern Cape Province of South Africa.

Mathebula, Molokomme, Jonas, & Nhemachena (2017) studied diversification of household income in three provinces of South Africa. Their cross-tabulation inspection revealed that urban formal areas households were more diversified than households in urban informal (peri-Urban) and rural formal settlements.

Gebru, Ichoku, & Phil-Eze (2018) analysed determinants of livelihood diversification strategies for farmers in the Eastern Tigray Region of Ethiopia. They established that livelihood diversification is positively affected by

the level of education, access to credit, income, membership to cooperatives, land size, and farm input use, while age, family size, and distance to the market were negatively affecting livelihood diversification. Upon realizing that livelihood diversification studies were conducted mainly in rural households, Emeru, Fikire, & Beza (2022) investigated the determinants of livelihood diversification among urban households in North Shewa Zone, Ethiopia. Their model revealed that the age of head of the household, education status, family size, credit access, market access, and training and extension services positively determined livelihood diversification. Also in urban setting of Ethiopia, Admasu, Damtie, and Taye (2022) explored the livelihood diversification of households but their investigation revealed that neither the age of the household head nor education significantly influenced household diversification.

When faced with shock, stress, or risk, households may lack alternative coping strategies and thus be forced to adopt strategies that enable them to merely survive. Gebru, Ichoku, & Phil-Eze (2018) identified that 16.9 percent of households were unable to diversify due to lack of the means to engage in any activity beyond agriculture.

METHODOLOGY

Data and Variables

Data from the Population & Housing Census (PHC) conducted in March-April 2022, which interviewed all households in Botswana, was used to construct household income sources. **Table 1** shows the questions that was posed to the household respondent and related possible responses. Question E08, E09 and E10 are multiple response questions. The respondent may mention, as many as possible, the agricultural activities that the household received cash from. Likewise, household activities (E09) and other cash/in-kind (E10) may result in multiple responses per household.

TABLE 1: Population & Housing Census Question used to construct income sources

2022 PHC QUESTION AND RESPONSES		
E08: Since last year this time did your household member(s) receive cash from Agricultural Activities?	**E09: Since last year this time did your household member(s) receive cash from Household Activities?**	**E10: Since last year this time did your household member(s) receive cash from Other Cash/In-kind Receipts?**
AGRICULTURAL ACTIVITIES	**HOUSEHOLD ACTIVITIES**	**OTHER CASH/IN-KIND**
01. Ploughing Services	**1.** Traditional Beer	**00.** Remittances from Outside Botswana
02. Hunting/trapping	**2.** Non Alcoholic Beverages	**01.** Employment Wage/Salary
03. Game/Wildlife propagation	**3.** Craftwork	**02.** Business Income
04. Fishing	**4.** Clothes	**03.** Rental Income
05. Tree Planting	**5.** Cooked Food	**04.** Pension of Retired Persons
06. Timber Harvesting	**6.** None	**05.** Contributory Pensions – Other
07. Selling Veld Products	**7.** Other	**06.** Interest on Savings
08. Selling Livestock		**07.** Dividend Payments
09. Selling Crop Produce		**08.** Child Maintenance
10. Piggery		**09.** Cash Gifts Received
11. Bee Keeping		**10.** Cash From Relatives
12. Dairy Produce		**11.** In-kind Gifts Received
13. Ostrich Farming		**12.** Cash Loans Received
14. Poultry		**13.** Destitute Persons Program
15. Horticulture		**14.** Orphan Care Program
16. Sorghum/Maize Processing		**15.** World War II Veterans Allowance
17. Fruits/Vegetable Processing		**16.** Old Age Pension
18. Hides and Skin Processing		**17.** Student Allowance
19. None		**18.** None
20. Other		**19.** Other

Table 2 shows the description of variables used in the analysis. All the analysis were made using Statistical Package for Social Scientists (SPSS) version 25. Graphs and figures were produced in Microsoft Excel based on SPSS outputs.

TABLE 2: Description of Variables used in the analysis

VARIABLE	DESCRIPTION
Income Sources	Multiple responses of household income sources (Responses: Agricultural activities, Household activities and other cash/in kind receipts)
Sex of Head of Household (HHH)	Sex of the household head (1= Male, 0 = Female)
Highest education level of	Education level of household head (1 = No Education, 2 = Primary, 3 = Secondary, 4 = Tertiary)
Marital Status of HHH	Marital Status of household head (1 = Married, 0 = Otherwise)
Religion of HHH	Religion of household head (1= Christian, 2 = Muslim, 3 = African Traditional Religion, 4 = Other Religions, 5 = No Religion)
Locality Type	Locality type of a household (1 = Urban, 2 = Urban Village, 3 = Rural)

Method of Analysis

The dependent variable in the study, household income sources, yields multiple responses to the question "Since last year this time did your household member(s) receive cash from Agricultural Activities, household activity or other cash/in-kind?" The responses were stored as three sets of polytomous variables corresponding to agricultural activities, household activities and other cash/in-kind. Under the agricultural activities response set each variable of the polytomous variables recorded one agricultural activity per household. If there is only one agricultural activity it will be listed in the first variable and the rest will have no responses. A binary variable called "Agricultural Activity" was created and takes the value "0" if the household does not source income from any agricultural activity and "1" if the household sourced income from at least one agricultural activity. The same was done for household activities and other cash/in-kind response sets.

To produce **Table 3**, a multiple response set was defined in SPSS using all the polytomous variables under agricultural activity, household activities and other cash/in-kind. A multiple response frequency table was then produced. To explore the relationship between income source and household characteristics, multiple response cross tabulation were constructed using agricultural activity, household activity and other cash/in-kind binary variables defined in the above paragraph.

FINDINGS AND DISCUSSIONS

Findings Analysis

Number of household responses and percent of households for detailed income sources

Table 3 illustrates the number of household responses and the percentage of households for detailed income sources related to agricultural activities, household activities, and other cash/in-kind receipts. The majority of households, 88.0%, reported that they have received cash from at least one source of other cash/in-kind receipt. Within the category of other cash/in-kind receipt, the majority of households (59.6%) reported receiving an employment wage or salary. This was followed by business income, reported by 15.8% of households and cash from relatives, reported by 13.0% of households.

Households reporting at least one agricultural activity comprised 17.1% of households. Within the agricultural sector, selling livestock was the most commonly reported activity, cited by 8.1% of households, followed by selling crops, reported by 4.3% of households.

The 2022 PHC revealed that 13.0% (90,289) of households reported at least one household activity as their source of income. Among these household activities, cash from cooked food was the most commonly reported, cited by 3.1% of households. This was closely followed by income from clothes, reported by 3.0% of households, and income from traditional beer, reported by 3.0% of households.

TABLE 3: Number of household responses and percent of households for detailed income sources

INCOME SOURCE	2022 NUMBER OF RESPONSES	2022 PERCENT OF HOUSEHOLDS
Agricultural Activities		
Selling Livestock	56,526	8.1
Selling Crop Products	2,992	4.3
Poultry	1,836	2.6
Ploughing Services	17,601	2.5
Selling Veld Products	4,411	0.6
Dairy Produce	3,817	0.6
Horticulture	2,373	0.3
Fruits or Vegetable Processing	2,025	0.3
Sorghum or Maize Processing	2,003	0.3
Tree Planting	1,904	0.3
Timber Harvesting	1,645	0.2
Fishing	109	0.2
Piggery	850	0.1
Hides and Skin Processing	621	0.1
Hunting or Trapping	481	0.1
Game or Wildlife Propagation	331	0.1
Bee Keeping	221	0.0
Ostrich Farming	103	0.0
Other - Agriculture Activities	10,688	1.5
Total Number of responses	**15,497**	
Total Number of Households	**118,827**	**17.1**
Household Activities		
Cooked Food	21,469	3.1
Clothes	20,926	3.0
Traditional Beer	20,712	3.0
Non-Alcoholic Beverage	8,921	1.3
Craftwork	7.592	1.1
Other - Cash_09	24,189	3.5
Total Number of responses	**103,809**	
Total Number of Households	**90,289**	**13.0**

TABLE 3 Cont'd: Number of household responses and percent of households for detailed income sources

INCOME SOURCE	2022 NUMBER OF RESPONSES	2022 PERCENT OF HOUSEHOLDS
Other Cash/In-Kind Receipts		
Employment wage or Salary	414,481	59.6
Business Income	11,029	15.9
Cash from Relatives	90,036	13.0
Old Age Pension	80,157	11.5
Cash Gifts Received	5,246	7.5
Rental Income	27,829	4.0
In-kinds Gifts Received	23,072	3.3
Child Maintenance	17,291	2.5
Student Allowance	16,926	2.4
Pension of retired persons	15,289	2.2
Destitute Persons	13,998	2.0
Interest on Savings	11,488	1.7
Cash loan Received	5,562	0.8
Remittances from outside Botswana	5,541	0.8
Orphan Care Programs	4,078	0.6
Dividend Payment	2,939	0.4
Contributory Pension	2,038	0.3
World War Veterans	246	0.0
Other - Other Cash_10	2,012	2.9
Total Number of responses	**913,841**	
Total Number of Households	**612,187**	**88.0**
None	63,446	
Grand Total number of responses	**2,437,429**	**100**

Income source and Type of Locality

Figure 1 shows household income sources by type of locality. "Other cash/in-kind" is the most common source of income in urban, urban village and rural areas. However, it is most prevalent in urban households, reported by 93.1% of them, compared to 89.1% in urban village households and 83.3% in rural households. While agriculture is a vital income source in rural areas where poverty is more prevalent, it is also contributes income to urban village and urban households (Government of Botswana, 2021). Agriculture income sources were reported by 26.1% of rural households, 14.1% of urban village households and 8.8% of urban households. Income from household activities shows relatively small variation across different locality types, with 14.8% of rural households reporting income from this source, followed by 12.9% of urban village households and 10.3% of urban households.

Households without any income source are predominantly found in rural areas, where 12.2% of households reported no income source. This is followed by urban village households, with 9.4%, and urban households, with 6.2%, reporting no income source.

FIGURE 1: PERCENT OF HOUSEHOLDS BY THEIR INCOME SOURCE AND TYPE OF LOCALITY

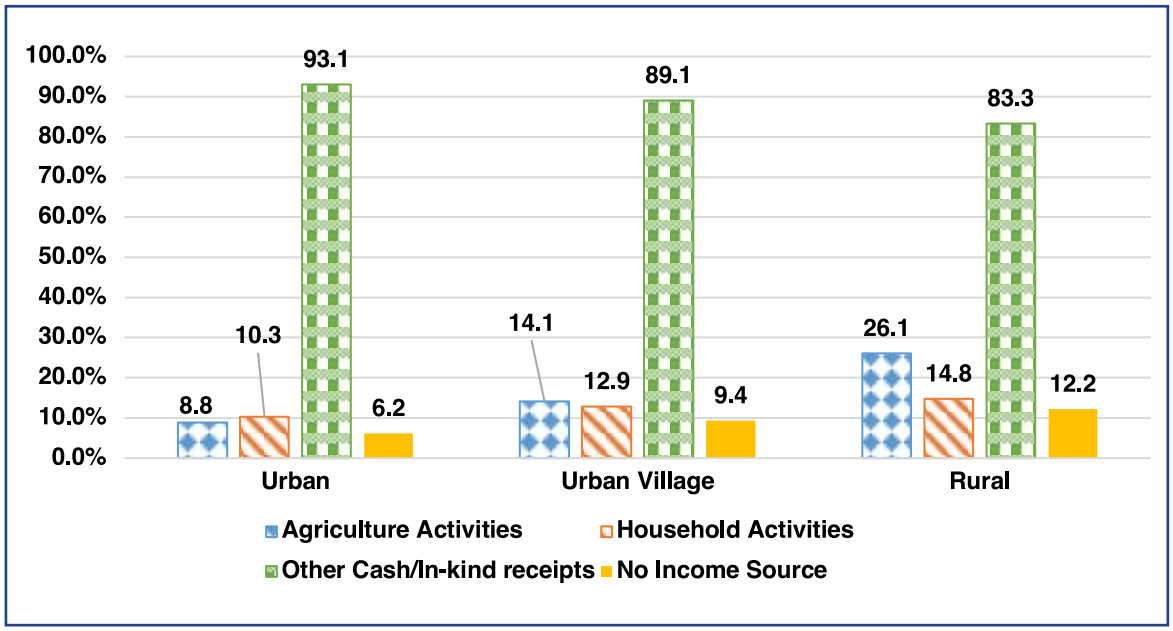
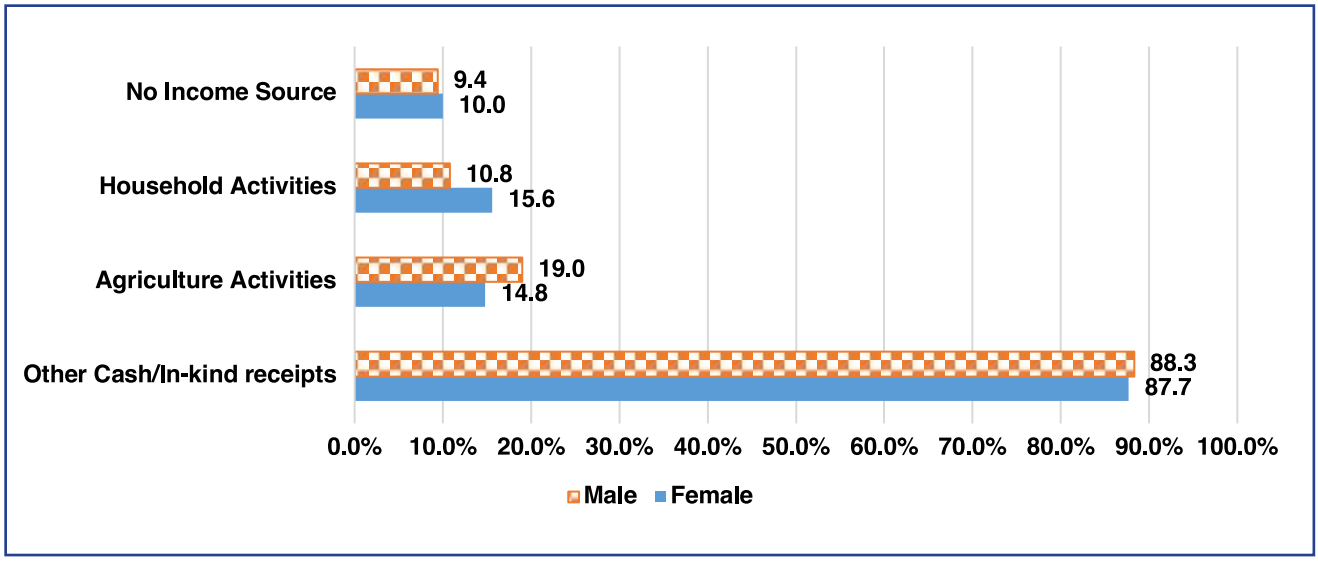


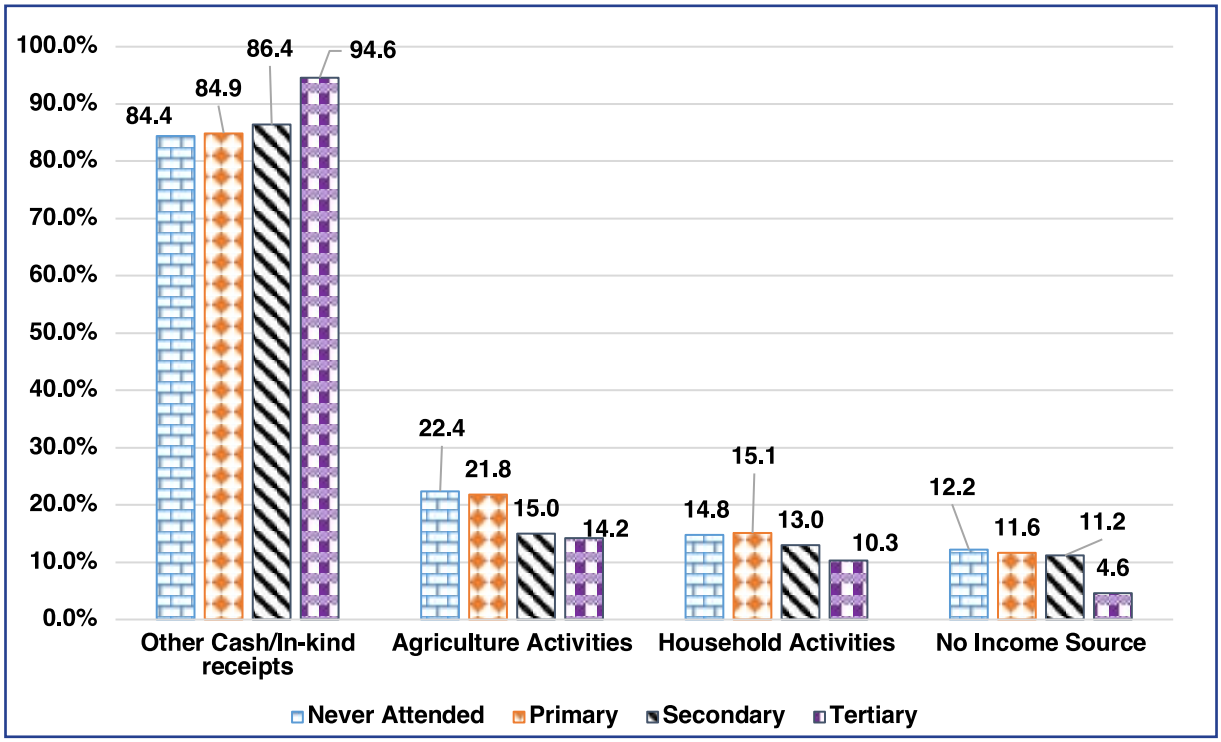
FIGURE 2: PERCENT OF HOUSEHOLDS BY THEIR INCOME SOURCE AND SEX OF HOUSEHOLD HEAD



Income source and education level of household head

Figure 3 presents the percentage of households receiving income from specified income sources and those without income sources, categorized by the household head's education level. Other cash/in-kind receipts were highest among households headed by persons with tertiary education at 94.7% and relatively lower in households headed by persons who never attended school. Conversely, households headed by uneducated persons (never attended school) reported the highest percentage (22.4%) receiving from at least one agricultural activity compared to households headed by persons with other education levels (primary, secondary and tertiary). Household activities and lack of income sources are prevalent among households headed by low-educated persons. Overall, households headed by educated heads tend to have better access to diverse income sources ("other cash/in-kind receipts"), while those with lower educational levels or no education at all tend to rely more on agricultural activities, household activities and are more likely to have no income sources.

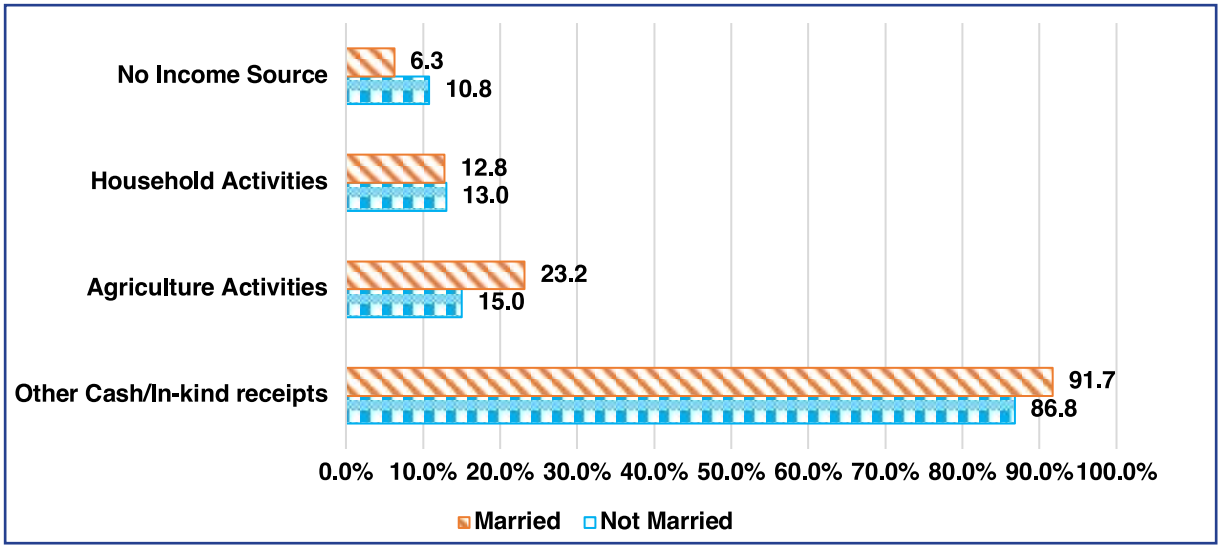
FIGURE 3: PERCENT OF HOUSEHOLDS BY THEIR INCOME SOURCE AND EDUCATION LEVEL OF HOUSEHOLD HEAD



Income source and marital status of household head

Figure 4 illustrates the relationship between the types of income source received and the household head's marital status expressed as percentages within each marital status category. The figure shows that agriculture activities and other cash/in-kinds receipts are more prevalent among households headed by married persons while households with no income source are more prevalent in households headed by unmarried persons.

FIGURE 4: PERCENT OF HOUSEHOLDS BY THEIR INCOME SOURCE AND MARITAL STATUS OF HOUSEHOLD HEAD



Income source and district

Based on the percentage within each district, **Table 4** compares type of income source received by a household across districts. Income from Other cash/in-kind receipts was reported mostly by households in town districts of Orapa (98.9%), Sowa (98.7%) and Jwaneng (96.4%) while relatively few proportion of household reported Other cash/in-kind receipts in Ngamiland west (75.4%), Delta (78.4%) and Kweneng west (80.9%). Ngamiland west and Kweneng west multi-dimensional poverty incidence of 60.82% and 50.34% were the highest and second highest among districts in Botswana. Furthermore, they were the only districts with more than 10% of their respective population living in severe multidimensional poverty (Government of Botswana, 2021). Agricultural activities cash receipts are predominantly received by households in Ghanzi (31.1%), Kgalagadi south (29.4%) and Kgalagadi North (28.1%). Household activities are more prevalent in Delta where 30.0% of households reported receiving income from followed by Central Mahalapye with 19.3%. Households reporting to have received no income from any source were proportionally higher in Ngamiland west (18.3%), Delta (17.9%) and Kweneng West (13.6%).

TABLE 4: Percent of Households by their income source and district

DISTRICT	OTHER CASH /IN-KIND RECEIPTS	AGRICULTURE ACTIVITIES	HOUSEHOLD ACTIVITIES	NO INCOME SOURCE
Gaborone	93.2	7.6	9.3	6.2
Francistown	92.2	8.6	12.4	7.1
Lobatse	93.6	8.6	10.6	5.5
Selibe Phikwe	91.0	14.6	13.8	7.9
Orapa	98.9	11.6	9.7	1.0
Jwaneng	96.4	11.9	5.3	3.3
Sowa	98.7	12.4	7.6	1.2
Southern	87.8	20.9	9.9	9.9
Barolong	88.0	21.6	10.1	9.2
Ngwaketse West	81.9	26.7	12.0	13.2
South East	93.8	11.2	10.4	5.5
Kweneng East	86.5	13.5	13.1	11.6
Kweneng West	80.9	27.1	16.8	13.6
Kgatleng	88.6	16.2	10.2	9.5
Central Serowe -Palapye	86.8	17.4	16.6	10.6
Central Mahalapye	85.7	23.1	19.3	10.3
Central Bobonong	88.9	29.3	15.5	8.0
Central Boteti	84.3	22.7	15.3	12.3
Central Tutume	85.0	20.4	12.8	12.3
North East	90.0	18.5	10.0	8.3
Ngamiland East	83.6	20.2	18.0	12.9
Ngamiland West	75.4	23.6	17.5	18.3
Chobe	91.5	14.8	14.8	6.8
Delta	78.4	20.0	30.0	17.9
Ghanzi	85.2	31.1	14.3	9.8
Central Kalahari Game Reserve (CKGR)	84.1	26.8	9.8	9.8
Kgalagadi South	85.8	28.1	8.7	10.6
Kgalagadi North	89.8	29.4	10.8	7.7

Income source combinations by locality, education, sex and marital status

Table 5 show distribution of household income source by different income source combinations. Household who reported to have received income from Other Cash/in-kind accounts for 64.4% of households in Botswana while households receiving cash from both agriculture and household activities accounted for 0.3%.

TABLE 5: Number and percent of household income source combinations

INCOME SOURCE	NUMBER OF HOUSEHOLDS	PERCENT OF HOUSEHOLDS
Other Cash/in-kind Receipts only	447,834	64.4
Agricultural and Other Cash	8,136	11.7
No Income Source	67,466	9.7
Households and Other Cash	56,023	8.1
Agricultural and Household and Other Cash	2,697	3.9
Agricultural Activities only	8,754	1.3
Household Activities only	5,553	0.8
Agricultural and Household Activities	1,743	0.3
TOTAL	**695,703**	**100**

Table 6 shows that the proportion of households that received cash from agricultural activities only is higher in rural areas households, for household whose head has never attended school or went up to primary, for male headed households and households headed by married persons

TABLE 6: Household income source combinations by percent of households within locality, education level of HHH, sex of HHH and marital status of HHH

		No Income Source	Agricultural Activities only	Household Activities Only	Other Cash Only	Agricultural and Household Activities	Agricultural and Other Cash	Households and Other Cash	Agricultural, Household and Other Cash
LOCALITY	Urban	6.2	0.2	0.4	76.8	0.1	6.5	7.7	2.1
	Urban Village	9.4	0.7	0.7	67.1	0.1	9.9	8.7	3.5
	Rural	12.2	2.7	1.2	53.0	0.5	17.3	7.5	5.5
EDUCATION LEVEL	Never Attended	12.2	1.9	1.1	56.1	0.4	15.0	8.2	5.1
	Primary	11.7	1.9	1.1	56.8	0.4	14.6	8.7	4.9
	Secondary	11.2	1.3	0.9	64.6	0.2	9.9	8.4	3.6
	Tertiary	4.6	0.4	0.3	73.9	0.1	10.8	7.0	2.9
SEX	Female	10.0	1.0	1.0	64.0	0.3	9.4	10.1	4.1
	Male	9.4	1.5	0.6	64.7	0.2	13.6	6.3	3.7
MARITAL STATUS	Not Married	10.8	1.2	0.9	65.0	0.3	9.9	8.2	3.6
	Married	6.3	1.3	0.5	62.6	0.2	17.1	7.5	4.6

POLICY IMPLICATIONS

The study results highlight the substantial effects of income insecurity on poverty. Approximately, 10 percent of households reported having no income sources. This lack of income contributes to the lack of basic necessities such as food, shelter, healthcare, and education, thereby exacebating poverty vulnerability. This deprivation perpetuates a cycle of poverty that is challenging to escape without external assistance.

Households led by uneducated persons encounter considerable difficulties in adapting to changing conditions or finding alternative income sources. This lack of education restricts their access to information, the ability to learn new skills, and the ability to seize opportunities that could enhance their economic status. Uneducated people often have fewer job prospects and are typically confined to low-paying, unskilled work due to their lack of qualifications for higher-paying positions. Without education, they may not be aware of or understand modern agricultural methods, new business opportunities, or ways to boost their productivity. This lack of knowledge and inappropriate mindset may hinders their ability to diversify income sources or adopt climate-resilient practices.

Prolonged and intensified climate change events such as droughts, floods, and veld fires pose significant threats to agricultural productivity, making rural households particularly vulnerable. The vulnerability is brought about by agricultural activities being more prevalent income source in rural areas. Addressing this vulnerability requires a comprehensive approach that includes diversifying income sources and promoting climate-resilient agriculture practices.

CONCLUSION/RECOMMENDATIONS

Conclusions

Other cash/in kind receipts is reported by 88.0% of households while agricultural activities and household activities were reported by 17.1% and 13.0%, respectively, as their income source. About a tenth (9.7%) of households reported that they have no income source.

Other cash/in kind income sources is predominantly reported by households in urban areas, headed by persons whose highest education is tertiary. Conversely, agricultural activities income sources are more common among households in rural areas, headed by males and also headed by persons who have no or less educational background. Likewise, household activities are reported mainly by households in rural areas and headed by persons who has never attended school. Female head households and households from the Delta district were found to constitute the majority of households sourcing income from household activities. Furthermore, household reporting no income source were higher in rural areas, among female headed households and households headed by a person who has never attended school.

The predominance of households headed by persons who never attended school in lack of income source, agricultural activity and household activity income sources is interpreted as a skill constraint to diversify household income sources to other cash/in-kind such as employment and business income. The head of household skill set is an important asset in the portfolio of a household that can be used to diversify the income source of a household. On the other hand, the predominance of rural households in households lacking income sources, agricultural activity and household activity income sources is interpreted as both access rights (services such as water, electricity e.tc) and livelihood opportunities constraints to diversify household income sources.

POLICY RECOMMENDATIONS

To address lack of income and over reliance in agricultural income generating activities, especially in rural areas, a multi-faceted approach is necessary. Below are recommendations to promote business investment, foster community inclusion, enhance education and training, prioritize income-less households, and develop alternative income sources in rural areas:

1. Promote Business Investment in Rural Areas

Infrastructure Development: Continue to improve transportation, communication, and utilities infrastructure to make rural areas more attractive to investors.

Public-Private Partnerships: Encourage collaborations between government and private sector to fund and support rural development projects.

2. Foster Inclusion of Local Communities in Rural Businesses

Community Ownership: Encourage businesses to patner with local rural communities to encourage profit-sharing. Atypical example being Selibi-Phikwe citrus project.

Local Sourcing: Promote the procurement of goods and services from local suppliers.

3. Capacitate Rural Households through Education and Training

Vocational Training: Ensure vocational training centres offers courses relevant to local industries and use of modern climate smart agricultural techniques and technology.

Adult Education: strengthen adult education programs to enhance literacy and basic skills.

4. Prioritize Households without Income Sources

Targeted Outreach: Identify and prioritize households without income sources for assistance programs by conducting a thorough needs assessment to identify households without income.
Program Implementation: Roll out programmes like Chema-Chema with a focus on the most vulnerable households.

5. Develop alternative income sources for households, especially those who only have agricultural activities as their income source.

Diversification: Promote non-agricultural income-generating activities such as handicrafts, tourism, and small-scale manufacturing.

Climate-Resilient Crops: Encourage the cultivation of climate-resilient crops and alternative farming practices.

Agro-processing: Develop local agro-processing units to add value to agricultural products.

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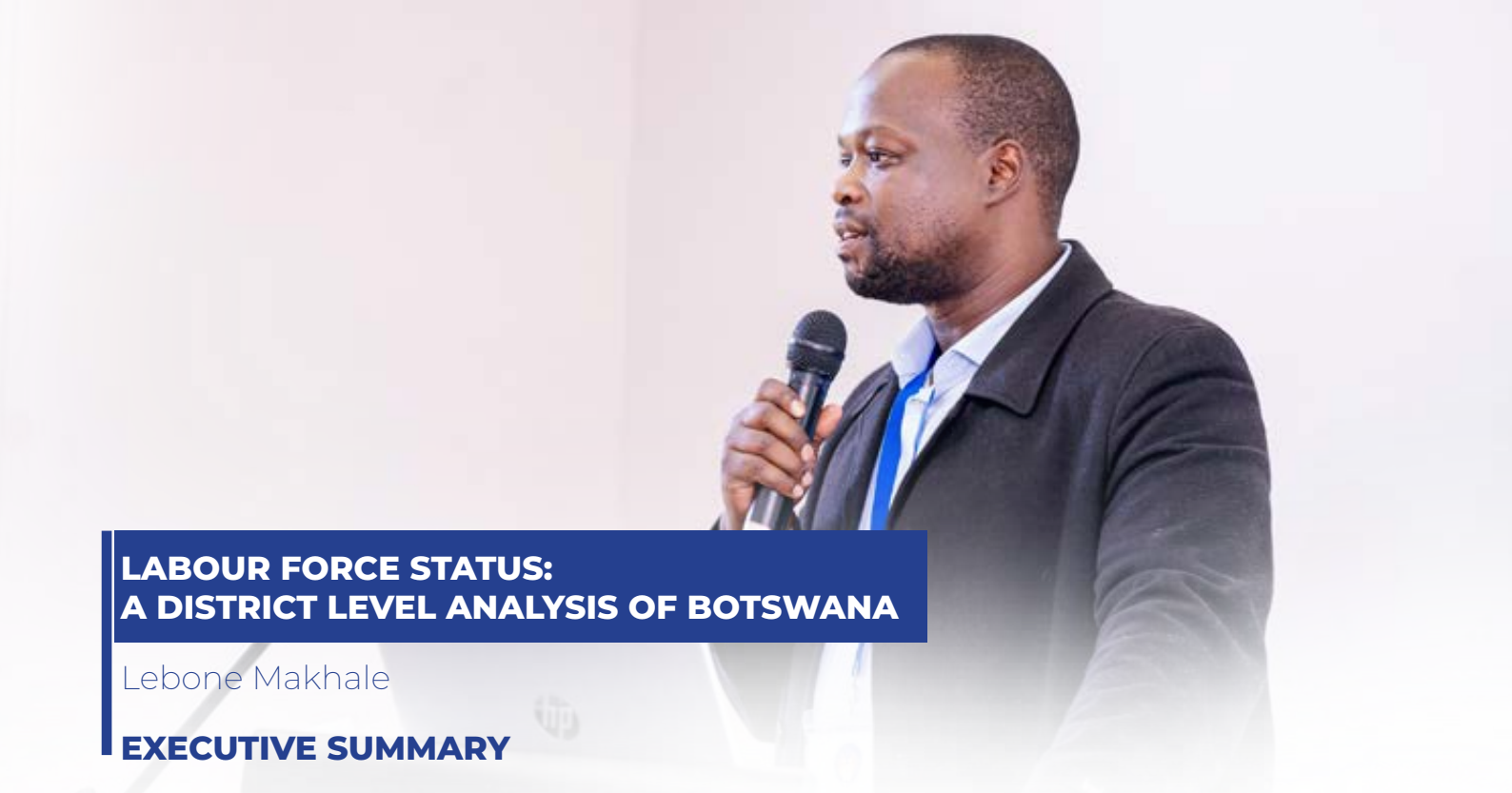

LABOUR FORCE STATUS: A DISTRICT LEVEL ANALYSIS OF BOTSWANA

Lebone Makhale

EXECUTIVE SUMMARY

The study examines district-level labour force dynamics in Botswana, focusing on employment, unemployment, and related factors. By analyzing census data from 2011 and 2022 and quarterly labour force surveys, the research aims to identify regional disparities in labour force status and propose targeted policy interventions to address these disparities. The literature review explores causes and theories explaining the existence of regional disparities in labour market dynamics. It evaluates empirical evidence and discusses policy implications to address regional disparities emphasising the importance of policy interventions tailored to specific regional challenges.

Employing a cross-sectional design, the study analyses census data and quarterly labour force surveys to examine trends and patterns in labour force status across districts. Comparative analysis techniques are used to explore district-level disparities. The analysis reveals significant variations in unemployment rates across districts, with some areas experiencing higher rates than the national average. Gender disparities in employment and challenges facing youth in accessing job opportunities are also evident.
The findings highlight the need for targeted policy interventions to address regional economic imbalances, gender disparities in employment, and youth unemployment challenges. Investments in infrastructure, education, and skills development are crucial for stimulating job creation and fostering inclusive economic growth. A comprehensive approach to policy formulation and economic planning is recommended, considering labour force dynamics and disparities across districts. Policy interventions should focus on promoting economic diversification across districts, promoting gender equality, improving education and skills training programs, and creating job opportunities for youth.

INTRODUCTION

The labour force plays a crucial role in shaping the economic landscape of a country, with regional variations significantly influencing employment opportunities and overall economic development. Understanding the labour force status at the district level is essential for identifying localized trends and regional disparities and formulating targeted policy interventions. This study examines the district-level analysis of the labour force status in Botswana.

The labour market has been of interest in several countries including Truman (2000) in the UK. Governments' worldwide aim to create jobs for all, reduce unemployment, and achieve full employment. This study is important in that the district-level estimate will help inform the policymakers about the distribution of various labour force states alongside their associated demographic characteristics. This is crucial in a country's quest to achieve full employment. The study will also inform existing literature on the Botswana labour market. For example, there is evidence of regional variation in the unemployment rate, with the capital, Gaborone, registering the highest rate. This was supported by Malema (2005) in a conference paper. What is not known is, however, the district-level variation of labour force states such as inactivity and unemployment. This study will therefore aim at estimating the level of employment, unemployment, and inactivity in the labour force in Botswana and explore how these vary by district and gender, identifying

the socio-economic factors which influence the labour force status and how they vary with geography. The objectives of this research will therefore be to estimate the level of employment, unemployment, and inactivity in the labour force in Botswana and explore how these vary by district and gender, identify the socio-economic factors which influence the labour force status and how they vary with geography.

Background and significance of the study

Botswana has experienced significant economic growth and development in recent decades. With its abundant mineral resources, particularly diamonds, Botswana has emerged as one of Africa's success stories in terms of economic performance. Despite overall progress, unemployment has remained a serious challenge that threatens to reverse economic gains. Unemployment, a critical concern in any labour market, can vary significantly across districts. By examining the unemployment rate at the district level, areas facing higher levels of joblessness can be identified, potentially indicating local labour market challenges. The district-level analysis enables a granular examination of labour force status, allowing for the identification of localised trends and disparities. This spatial perspective is crucial for understanding regional variations in unemployment rates and formulating targeted policy interventions. Understanding the factors influencing labour force participation, employment, and unemployment at the district level is important for promoting inclusive economic growth and addressing regional inequalities.

Research objectives

- To identify regional similarities or disparities in the labour force status indicators across districts and understand the underlying factors contributing to these variations.
- To propose targeted policy recommendations tailored to address the identified regional disparities and improve labour market outcomes in specific districts.

Literature Review

Regional disparities in unemployment represent a critical challenge within labour economics, reflecting the unequal distribution of job opportunities and labour market conditions across different geographical areas. This literature review examines the causes and consequences of these disparities, explores theories explaining their existence, evaluates empirical evidence, and discusses policy implications.

Causes of Regional Unemployment Disparities

Regional disparities in unemployment can arise from various factors, including differences in economic structure, industrial composition, demographic characteristics, and policy interventions. Economically marginalised regions may experience higher unemployment rates due to the decline of traditional industries, technological changes, and the impacts of globalization (Autor et al., 2013). Furthermore, demographic factors such as population ageing or outmigration can intensify regional unemployment disparities by reducing the labour force and creating skills mismatches (Faggio & Overman, 2014).

Theories Explaining Regional Unemployment Disparities

Various theories in labour economics offer explanations for regional disparities in unemployment rates. One key theory is the spatial mismatch theory, first introduced by Kain in 1968. This theory highlights the discrepancy between job opportunities and where people live, particularly in urban settings. It suggests that unemployment differences arise when there's a gap between job availability and the residential locations of potential workers.

Additionally, theories of economic agglomeration provide insights into regional unemployment variations. Glaeser and Saiz (2003), Moretti (2004), Rosenthal and Strange (2004), Combes et al. (2008); and Ellison et al., (2010) studied economic agglomeration and concluded that regions with concentrations of industries or skilled workers may have lower unemployment rates. This occurs because these regions benefit from positive externalities and knowledge sharing among clustered industries and talent, leading to increased innovation and productivity.

Krugman (1991), Ciccone and Hall (1996), Fujita et al., (1999), Redding and Venables (2004), Rosenthal and Strange (2003); and Duranton and Puga (2004) offer an understanding of how factors like transportation costs, economies of scale, and agglomeration effects impact regional economic differences, including unemployment rates. The New Economic Geography framework underscores the significance of geographical factors in shaping economic outcomes, including unemployment patterns across regions.

Empirical Evidence

Empirical studies examining regional unemployment disparities have found significant variation across geographical areas and over time. Research using regional-level data has documented persistent disparities between urban and rural areas, as well as between different regions within countries (Blanchflower & Oswald, 1994). Furthermore, Autor et al., (2003) highlighted the role of local labour market conditions, such as job growth, industry composition, and educational attainment, in shaping regional unemployment rates.

The Government of Botswana's policies demonstrate a commitment to tackling unemployment. Vision 2036 aims to achieve prosperity for all, with meaningful employment being a key avenue toward this goal. A critical performance indicator is reducing the unemployment rate to 5%, significantly lower than the current rate. The objectives of the National Transformation Strategy under the Human and Social Development Pillar align with Sustainable Development Goal 4, which calls for improved school infrastructure. Additionally, the National Spatial Plan 2036 seeks to enhance access to education and employment by advocating for strategies that reduce transportation costs and boost regional economies (Ministry of Lands and Water Affairs, 2020).

The Government of Botswana has long recognized the imperative of intervening to foster the development of rural areas, aiming to address socioeconomic disparities between rural and urban regions. A significant initiative in this regard is the Rural Area Development Policy, which underscores the government's commitment to enhancing infrastructure, services, and livelihood opportunities in rural areas (Ministry of Finance and Development Planning, 2002). This policy seeks to bridge the urban-rural development gap and promote more equitable economic growth across the country. Additionally, the government has implemented the Remote Area Allowance, serving as an incentive for professionals working in rural areas. This allowance aims to attract skilled workers to remote regions and mitigate disparities by ensuring access to essential services and opportunities for rural residents (Ministry of Finance and Development Planning, 2002).

Furthermore, the Government of Botswana's National Transformation Strategy and Vision 2036 are closely aligned with global and continental development agendas, including the Sustainable Development Goals (SDGs) and the African Union's Agenda 2063. These strategies reflect Botswana's commitment to achieving sustainable development, promoting inclusive growth, and addressing regional disparities in line with international aspirations.

Policies aimed at promoting regional economic development, such as infrastructure investments, tax incentives, and business support programs, can stimulate job creation and reduce unemployment in economically disadvantaged areas (Neumark et al., 2011). Moreover, investments in education, training, and workforce development can help equip workers with the skills needed to compete in regional labour markets and reduce disparities in employment opportunities (Holzer, 2019).

In conclusion, regional disparities in unemployment are a complex and multifaceted phenomenon influenced by economic, demographic, and policy factors. Theoretical insights and empirical evidence provide valuable perspectives on the mechanisms driving these disparities, while policy interventions play a pivotal role in fostering inclusive and equitable regional labour markets. Continued research efforts are essential to deepen our understanding of regional unemployment disparities and assess the efficacy of policy interventions in addressing them.

Despite Botswana's overall economic success, the country has consistently faced a significant challenge in combating high unemployment rates. Since the inception of labour force surveys, the nation has grappled with double-digit unemployment figures, a concerning trend that has endured over time. The persistently elevated unemployment rates among the youth and female populations are of particular concern, which exceeds the national average.

Over the years, the unemployment situation in Botswana has shown a worrying trajectory. For instance, between 2015 and 2021, the unemployment rate surged from 17.5 percent to a distressing 26.0 percent of the labour force (Statistics Botswana, 2015 and 2021). Of particular note is that the majority of the unemployed individuals in the country are the youth. Statistics Botswana (2023) indicates that the unemployment rate of Botswana has been increasing from quarter to quarter since the inception of the quarterly multi-topic survey labour force module.

Skill mismatches, the misalignment between the skills possessed by the workforce and those demanded by employers, have been recognized as a significant barrier to employment expansion. Stepanyan and Leigh (2013) identified a pronounced correlation between skill mismatches and unemployment in their study of nine small to middle-income countries, including Botswana. This misalignment has been recognized as a critical issue that needs to be addressed to improve employment rates.

METHODOLOGY

Research design and approach

This study employs a cross-sectional design to analyze the labour force status at the district level in Botswana using 2022 census data, as well as quarterly labour force surveys. The analysis focuses on examining trends in unemployment rates across districts and identifying spatial patterns and disparities in labour force status.

Data collection sources and methods

District-level data from the 2022 national censuses is utilized. These datasets contain information on demographic characteristics, employment status, educational attainment, and other relevant variables for each district in Botswana. Data from quarterly labour force surveys conducted by the national statistical agency are also utilized. These surveys provide timely and granular data on employment, unemployment, and labour force participation rates.

Description of the variables and indicators used

The primary focus of this study is the labour market, which includes individuals aged 15 and above, excluding retired individuals, the sick, students, and prisoners. The key variables of interest are the employment and unemployment rates per region. The employed population encompasses apprentices, individuals paid in cash or kind, the self-employed, and volunteers. The unemployment rate is defined as the proportion of the labour force actively seeking employment but unable to find work. Additional variables considered include demographic characteristics, economic indicators, and geographic identifiers.

Analytical methods employed

Descriptive statistics will be computed to summarize the distribution of unemployment rates across districts. Measures such as mean, median, standard deviation, and percentiles will provide insights into the central tendency and dispersion of unemployment rates (Helsel & Hirsch, 2002). Graphical techniques such as histograms and tables are used for visualization.

The analysis focused on exploring district disparities in labour market outcomes, youth unemployment disparities per district, and paid employment type disparities per district. Descriptive statistics, percentages and rates, were computed to summarize the main characteristics of the data. Comparative analysis techniques were employed to examine differences and similarities across districts and demographic groups. Graphical representations such as tables and figures were utilized to visually present the findings and trends observed in the data.

New perspectives and approaches in analyzing regional disparities in employment entail innovative methodologies that offer fresh insights into the complex dynamics of labour markets. Among the most novel methods are spatial econometrics, which explicitly models spatial interdependencies and heterogeneity, such as the Spatial Durbin Model (LeSage & Pace, 2009). Additionally, leveraging big data and machine learning techniques enables researchers to uncover hidden patterns and predict regional employment outcomes based on diverse socio-economic factors (Cortez & Morais, 2007). Network analysis provides a unique perspective by examining the interconnectedness of labour markets and economic activities across regions, identifying key economic hubs and clusters (Frenken et al., 2007). Finally, agent-based modelling offers a bottom-up approach, simulating individual agents' behavior to understand emergent phenomena and policy impacts on regional employment (Tesfatsion & Judd, 2006). These approaches represent innovative avenues for understanding and addressing regional employment disparities.

Data analysis

Data cleaning focused on identifying and addressing missing values and duplications in the dataset. Duplications were carefully checked and removed to avoid redundancy and ensure each observation was unique. Missing values were identified and assessed for their impact on the analysis. Variables with significant missing data were excluded from further analysis to maintain the integrity of the findings. Variables marked as #NULL, indicating undefined or non-existent values, were identified and excluded from the analysis of employment per sector due to their lack of relevance. Therefore, this study was unable to analyse the employment per sector at the district level since a significant amount of the data was marked #NULL.

In the analysis of district disparities in labour market outcomes, various analytical approaches were applied to gain insights into the patterns and trends observed in the data. Descriptive statistics were employed to summarize the main characteristics of the labour market data. Percentages and rates were computed to provide a snapshot of key indicators such as the size of the labour force, unemployment rates, and gender distribution of paid employment. Comparative analysis techniques were used to examine differences and similarities across districts. This involved comparing labour market indicators such as unemployment rates, youth unemployment rates, and gender distribution of paid employment between different districts to identify disparities. Graphical representations, including tables, figures, and charts, were utilized to visually present the findings from the analysis. Tables were used to summarize numerical data, while figures and charts were used to illustrate patterns in the data, making it easier to interpret and understand.

Presentation and interpretation of the findings from the Data Analysis

This section presents the analysis of labour market dynamics, highlighting district disparities, youth unemployment rates, and paid employment type differences across various districts. Through comparative analysis, it presents key insights into the labour market challenges in Botswana's context.

Table 1 below provides the size of the labour market and the unemployment rates from the Population and housing census of Botswana 2022. It indicates the presence of district disparities in labour market outcomes. While some districts struggle with high unemployment rates, others enjoy relatively lower levels of unemployment, reflecting differences in economic development, infrastructure, and policy interventions. It appears that there is a pattern between the size of the labour market in a district and its unemployment rate. Specifically, districts with a large labour force tend to have higher unemployment rates, while districts with a small labour force tend to have lower unemployment rates. For example, districts like Kweneng East and Serowe/Palapye, which have relatively large labour forces, also exhibit high unemployment rates. While, districts like Sowa and CKGR, with smaller labour forces, show lower unemployment rates. This pattern suggests that the size of the labour market may influence employment dynamics within different districts. Ngwaketse stands out as an exception in the analysis, displaying a relatively low labour force compared to other districts yet exhibiting a significantly high unemployment rate. This variance suggests that addressing unemployment disparities across districts will require a tailored approach.

TABLE 1: Labour Force Statistics Per District

DISTRICT	LABOUR FORCE	UNEMPLOYMENT RATE
Gaborone	115,687	17.9
South East	45,372	33.8
Kgatleng	41,339	41.3
Kweneng East	112,598	48.2
Kweneng West	19,045	36.9
Francistown	42,841	22.7
Lobatse	12,690	21.9
Selibe-Phikwe	15,976	22.2
Sowa	1,538	11.8
Orapa	4,386	10.9
North East	23,279	30.7
Boteti	23,954	43.0
Mahalapye	40,712	21.3
Serowe/Palapye	60,861	23.6
Bobonong	25,894	31.9
Tutume	49,483	36,9
Kgalagadi North	9,415	26.4
Kgalagadi South	11,247	35.4
Ngami East	41,026	42.3
Ngami West	21,055	37.7
Barolong	16,784	41.5
Ngwaketse	7,818	42.1
Southern	42,243	43.1
Chobe	14,990	22.9
Jwaneng	9,609	15.3
CKGR	260	0.0
Ghanzi	22,145	28.4
Delta	2,019	11.6

Table 2 highlights variations in employment and unemployment rates across different strata. Urban villages face the most severe unemployment issues, with the highest average unemployment rate. At the same time, towns and cities have the lowest unemployment rate, suggesting better employment opportunities in towns and cities when compared to urban village settings. Rural areas fall in between, indicating moderate economic challenges. The table shows further that a significant proportion of Botswana's labour force is concentrated in urban villages and rural areas. The high unemployment rates in urban villages in Botswana reveal a spatial mismatch, with the labour force predominantly located in urban villages. This situation suggests that urban villages may struggle to generate sufficient job opportunities for their labour force.

TABLE 2: Employment and Unemployment rates by Strata

	EMPLOYED	UNEMPLOYED	UNEMPLOYMENT RATE
Towns & Cities	226,351	54,210	19.3
Urban Villages	461,114	193,406	29.6
Rural Areas	361,099	98,422	21.4

FIGURE 1: EMPLOYED AND UNEMPLOYED PER DISTRICT

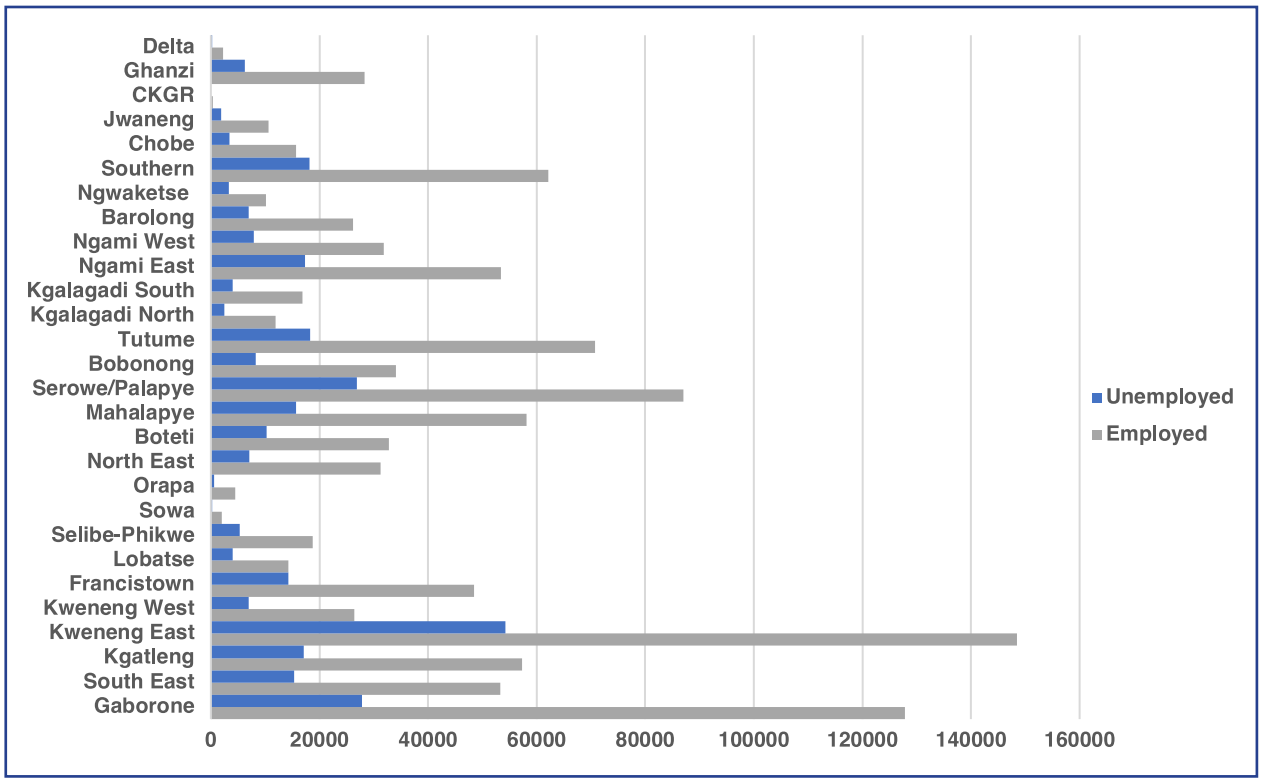

Figure 1 provides a representation of the employment and unemployment numbers per district. The data indicates a correlation between the size of the labour market and the number of unemployed individuals, suggesting that districts with larger labour markets tend to have higher unemployment numbers. This indicates potential challenges in matching job seekers with available opportunities, reflecting economic dynamics and possibly structural issues in employment distribution and skills alignment within these districts.

Figure 2 below illustrates the variation in unemployment rates across urban centres in Botswana, providing insights into the district distribution of unemployment within the country. Towns such as Sowa and Orapa, where mining is the primary economic activity, tend to have unemployment rates notably lower than the national average for populations aged 15 and above. This trend can be attributed to the influx of workers migrating to these areas, seeking employment opportunities within the mining sector. As a result, the proportion of the population engaged in employment within these mining towns is notably higher.

FIGURE 2: UNEMPLOYMENT IN URBAN AREAS

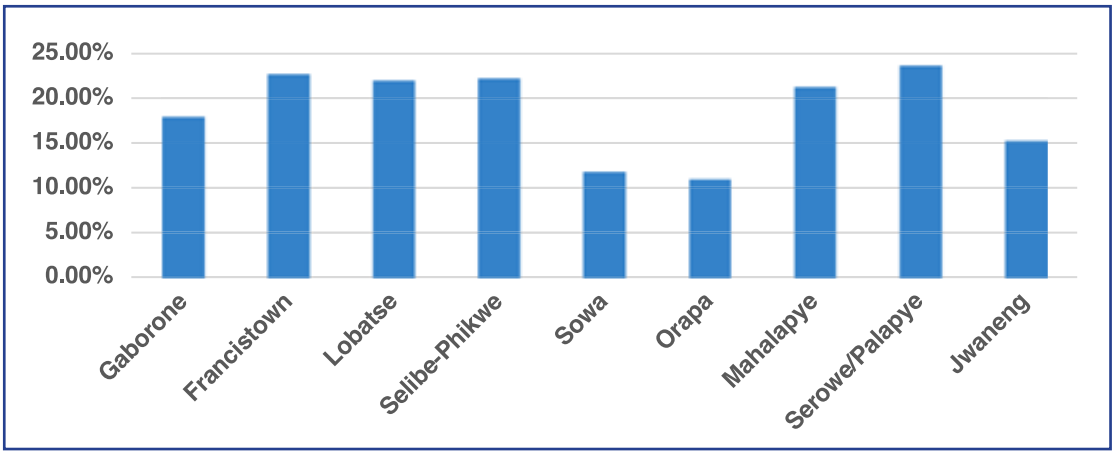

FIGURE 3: DISTRICT UNEMPLOYMENT RATES 15+ AGE GROUP

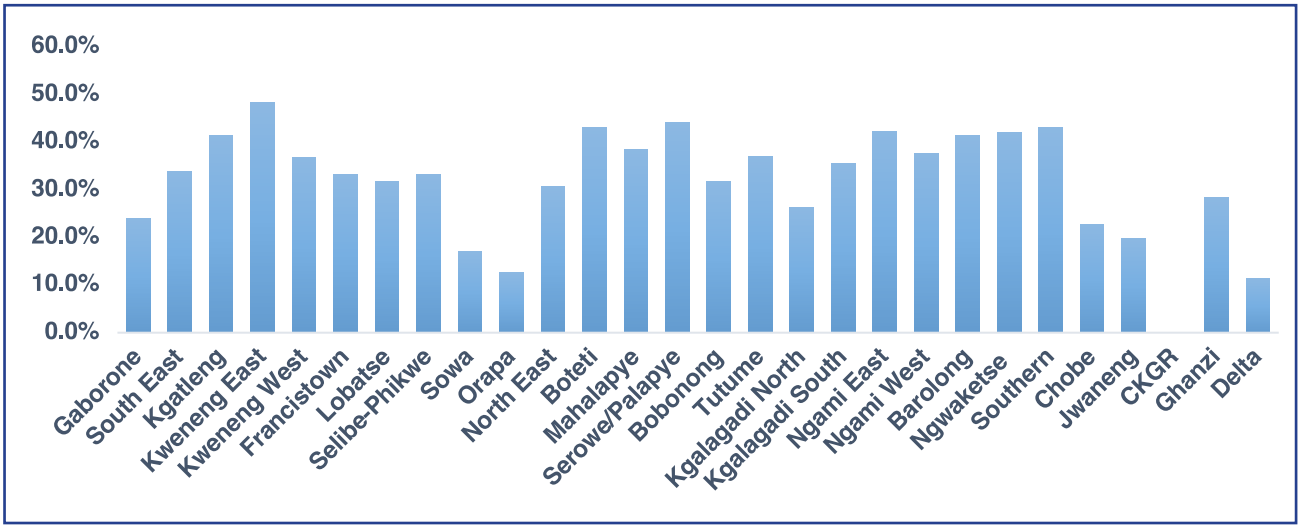

Figure 3 reveals a concerning trend where unemployment rates surpass the national average in the majority of Botswana's census districts. Out of the 17 districts surveyed, 13 exhibit unemployment rates higher than the national average. This highlights the pervasive nature of unemployment challenges across the country.

Gender disparities in employment at the district level

Gender disparities in employment at the district level highlight differences in job opportunities and access to work between men and women within specific geographic areas, shedding light on the localized factors influencing workforce participation.

TABLE 3: Gender Distribution Of Paid Employment By District

DISTRICT	FEMALE PROPORTION (%)	MALE PROPORTION (%)
Gaborone	50.3	49.7
South East	50.4	49.6
Kgatleng	45.8	54.2
Kweneng East	46.9	53.1
Kweneng West	37.3	62.7
Francistown	48.7	51.3
Lobatse	47.1	52.9
Selibe-Phikwe	51.1	48.9
Sowa	34.5	65.5
Orapa	47.3	52.7
North East	49.5	50.5
Boteti	41.5	58.5
Mahalapye	45.0	55.0
Serowe/Palapye	46.1	53.9
Bobonong	50.9	49.1
Tutume	48.0	52.0
Kgalagadi North	49.5	50.5
Kgalagadi South	46.8	53.2
Ngami East	46.4	53.6
Ngami West	48.4	51.6
Barolong	44.8	55.2
Ngwaketse	41.4	58.6
Southern	46.9	53.1
Chobe	44.0	56.1
Jwaneng	39.6	60.4
CKGR	25.0	75.0
Ghanzi	45.1	54.9
Delta	40.2	59.8

Table 3 above highlights a noticeable gender imbalance in paid employment, with some districts having a higher proportion of one gender over the other. Districts like Kweneng West, Ngwaketse, and CKGR have a significantly higher proportion of males in paid employment compared to females, while districts like Sowa have a higher proportion of females. Urban areas like Gaborone and Francistown tend to have more balanced gender distributions compared to rural areas. This could be due to greater economic diversity and employment opportunities in urban centres, leading to more balanced participation of both genders in the workforce.

Youth unemployment rates and characteristics at the district level

Youth unemployment is a serious challenge in Botswana, particularly given that young people constitute a significant majority of the population and the labour force. **Table 3** below indicates noticeable disparities in youth unemployment rates across districts. Some districts, such as Kweneng East, Francistown, and Ngami West, exhibit relatively high youth unemployment rates exceeding 40%, indicating significant challenges for young adults in accessing employment opportunities. On the other hand, districts like Orapa, CKGR, and Delta have considerably lower youth unemployment rates, suggesting better employment prospects for youth in these areas.

TABLE 4: Youth Labour Force Characteristics Per District

DISTRICT	UNEMPLOYMENT RATE (15+ AGE)	YOUTH UNEMPLOYMENT RATE (15 – 35)	YOUTH LABOUR TO TOTAL LABOUR PROPORTION
Gaborone	17.9	27.6	67.0
South East	33.8	33.3	75.7
Kgatleng	41.3	48.8	69.1
Kweneng East	48.2	41.2	90.3
Kweneng West	36.9	36.9	82.4
Francistown	22.7	33.8	76.9
Lobatse	21.9	32.4	71.2
Selibe-Phikwe	22.2	34.4	69.4
Sowa	11.8	21.8	48.8
Orapa	10.9	24.6	32.2
North East	30.7	33.9	70.9
Boteti	43.0	39.5	91.8
Mahalapye	21.3	40.4	76.1
Serowe/Palapye	23.6	42.0	84.6
Bobonong	31.9	36.9	68.7
Tutume	36.9	38.5	80.3
Kgalagadi North	26.4	28.4	74.1
Kgalagadi South	35.4	36.0	88.8
Ngami East	42.3	38.7	89.9
Ngami West	37.7	38.6	97.5
Barolong	41.5	41.2	83.3
Ngwaketse	42.1	39.7	82.6
Southern	43.1	42.8	83.0
Chobe	22.9	26.4	67.7
Jwaneng	15.3	25.9	59.5
CKGR	0.0	0.0	61.5
Ghanzi	28.4	28.6	84.6
Delta	11.6	15.1	54.7

The proportion of individuals aged 15 to 35 in the labour force varies across districts. While some districts, such as Kweneng East and Serowe/Palapye, have a high proportion of youth in the labour force, others, like CKGR and Delta, have a lower representation of youth in the workforce. The relationship between the proportion of youth in the labour force and youth unemployment rates reveals mixed patterns. While some districts with a higher proportion of youth in the labour force experience high youth unemployment rates, suggesting potential challenges in absorbing young workers into the workforce, other districts exhibit lower youth unemployment rates despite a similar or even higher proportion of youth in the labour force. This suggests that factors beyond the size of the youth labour force, such as economic conditions, education and skills levels, and the availability of job opportunities, play a significant role in determining youth employment outcomes.

Discussions

The analysis of labour market dynamics in Botswana reveals several key insights into the country's economic landscape and sheds light on the challenges facing its workforce. District disparities in unemployment rates highlight the uneven distribution of economic opportunities and development across the nation. This reflects variations in factors such as infrastructure, economic diversification, labour migration within Botswana, and policy interventions, which influence local labour market conditions.

One notable trend observed is the relationship between the size of the labour force in a district and its unemployment rate. Districts with larger labour forces tend to exhibit higher unemployment rates, while those with smaller labour forces tend to have lower unemployment rates. This suggests that factors such as population density, urbanization, and industrialization may contribute to differences in employment opportunities and labour market outcomes at the district level.

The analysis also highlights the impact of the mining sector on local employment dynamics. Towns where mining is the primary economic activity tend to have lower unemployment rates compared to the national average. This can be attributed to the workers migrating to these areas only after securing employment opportunities within the mining industry. The presence of mining-related employment not only directly contributes to job creation but also stimulates economic activities in the local economy, leading to indirect job opportunities and lower unemployment rates. Furthermore, urban villages have the highest indicate that there is limited economic activity and this could be the cause of high unemployment in these areas.

Gender disparities in employment are also evident at the district level, with some districts exhibiting a significant imbalance in the gender distribution of paid employment. Rural areas tend to have more pronounced gender disparities compared to urban centres, reflecting differences in economic activities and traditional gender roles. Addressing these disparities requires targeted policies and interventions aimed at promoting gender equality and creating inclusive employment opportunities for both men and women across all districts.

The analysis of youth unemployment rates highlights the challenges facing young adults in accessing employment opportunities in Botswana. Some districts experience disproportionately high youth unemployment rates, indicating significant barriers to entry into the workforce for young people. One of the contributing factors to these disparities may be internal migration patterns, with young people moving from districts with limited economic opportunities to areas perceived to offer better prospects. Additionally, migration within districts could also contribute to uneven labour market outcomes. Factors such as education and skill levels, economic conditions, and the availability of job opportunities may play a crucial role in determining youth employment outcomes. Policy interventions focusing on education and skills development, entrepreneurship promotion, and job creation are essential to address youth unemployment and foster inclusive economic growth.

POLICY IMPLICATIONS

The disparities in district-level unemployment rates emphasize the need for targeted policy interventions to address regional economic imbalances. Policy formulation and economic planning should prioritize investments in infrastructure, education, and skills development in districts with higher unemployment rates to stimulate economic growth and job creation. Additionally, embracing the National Transformation Strategy coupling it with Local Economic Development Strategy and competitive reinforcement initiatives to form clusters can be instrumental. This approach allows for the identification of districts' competitive advantages within the sectors prioritized in the National Transformation Strategy, fostering the development of specialized economic clusters tailored to each District's strengths.

The findings highlight the importance of addressing gender disparities in employment through targeted policy interventions. Measures aimed at promoting gender equality in education and training, providing support for female entrepreneurship, and implementing affirmative action policies can help improve women's access to employment opportunities and contribute to more inclusive economic growth.

The analysis of youth unemployment rates highlights the need for targeted policies to address the challenges facing young adults in accessing employment opportunities at the district level. Policy interventions should focus on improving education and skills training programs, promoting youth entrepreneurship and innovation, and creating job opportunities in sectors with high youth employment potential. Development and implementation of district-specific skills development programs tailored to the unique needs of each district, ensuring that the labour force possesses the skills demanded by local employers.

To ensure effective policy formulation and economic planning in Botswana, adopting a comprehensive approach that addresses labour force dynamics and disparities across districts is important. By implementing targeted interventions and promoting inclusive growth strategies tailored to the unique needs of each district, the government can foster sustainable economic development and enhance livelihoods for all citizens. Embracing a district-specific approach in developing and implementing national policies and strategies will better accommodate the diverse challenges and opportunities present throughout the country.

Data collection and monitoring are crucial for effective policy implementation. Regular and detailed labour market assessments at the district level must be conducted to monitor employment trends and evaluate the impact of policy interventions. The use of up-to-date, granular data to inform policy decisions ensures that interventions are tailored to the specific needs of each district.

CONCLUSION AND RECOMMENDATIONS

In conclusion, the analysis has revealed significant disparities in labour market dynamics across districts in Botswana, with implications for policy formulation and economic planning. Key findings include district-level variations in unemployment rates, gender disparities in employment, and challenges facing youth in accessing job opportunities. It appears that some areas where unemployment is very high are being left behind, despite efforts to address broader economic challenges. This highlights the need for targeted interventions and inclusive strategies tailored to the unique needs of each district. By addressing these disparities and ensuring that all areas have access to economic opportunities, equitable and sustainable development throughout the country can be promoted.

It is important to acknowledge the limitations of the study, such as the reliance on data from the Population and Housing Census of 2022 and the lack of qualitative insights into local labour market conditions. The study's narrow focus on labour force dynamics and disparities across districts in Botswana may overlook significant influencers of employment outcomes, such as macroeconomic conditions, government policies, and cultural factors. Additionally, it lacks an analysis of these variables over time, limiting the understanding of evolving trends and dynamics.

For future research, it is recommended to conduct more detailed studies exploring the underlying factors contributing to district-level disparities in employment outcomes. It is essential to emphasize the importance of regular data collection at the district level to track changes over time and ensure informed decision-making. Addressing these research gaps will contribute to more informed policy-making and the development of targeted interventions to promote inclusive and sustainable economic growth in Botswana.

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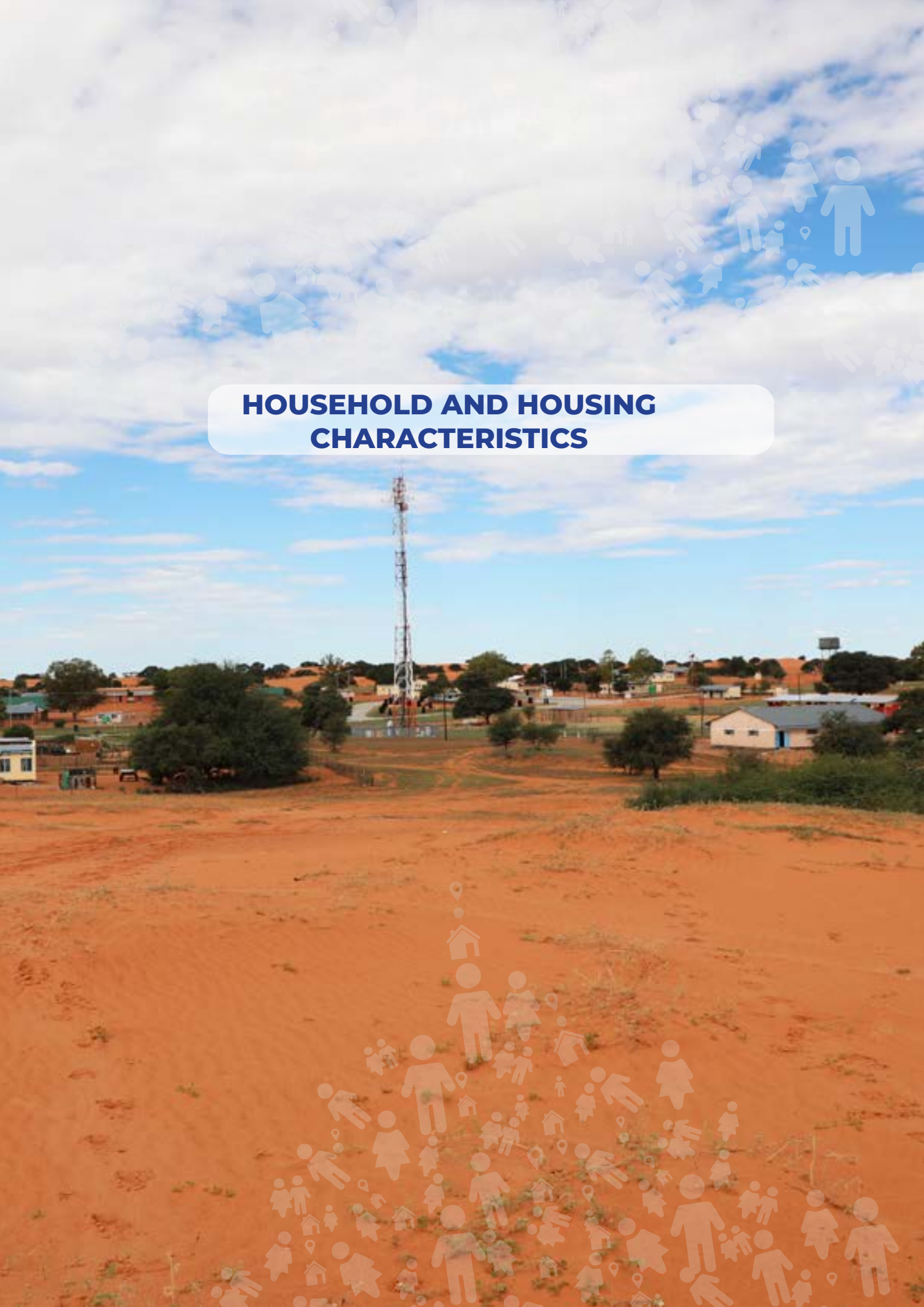
HOUSEHOLD AND HOUSING CHARACTERISTICS



ASSESSMENT OF WATER SUPPLY-SANITATION-AND-HYGIENE (WASH) PRACTICES AMONG HOUSEHOLDS IN BOTSWANA

Enock Ngome[1], Kakanyo Fani Dintwa[2], Kwashirai Chigodora[3]

EXECUTIVE SUMMARY

Introduction

This study aims to analyze the distribution patterns of water source infrastructure, sanitation facilities, and bathroom availability among households in Botswana, utilizing data from the 2022 Population and Housing Census conducted by Statistics Botswana. The primary objectives include assessing access to safe drinking water, examining the types of toilet facilities used by households, and evaluating the availability of bathrooms within households.

Methodology

The study utilizes data from the 2022 Population and Housing Census as its primary data source. Descriptive statistics, including frequencies and percentages, are employed to summarize the distribution of water source infrastructure, sanitation facilities, and bathroom availability. Data visualization techniques such as charts and graphs are utilized to uncover patterns, and cross-tabulations are conducted to explore variations across census districts and localities.

Main Findings

Main Source of Drinking Water for Household:

The analysis reveals that the primary source of drinking water varies among households, with a significant portion having access to piped water indoors or outdoors. However, disparities exist across districts and localities, with some areas demonstrating exceptionally high levels of access to improved water infrastructure, while others face severe deficiencies. The Water Utilities Corporation (WUC) serves as the primary water provider for most households. It is evident from the results that at national level about 92.9% of the households have access to sources of piped water. Cities/Towns recorded the highest access with proportions of households with access to sources of piped water ranging between 99.9% - 99.6%. The districts exhibiting low access to source of piped water include CKGR, Kweneng West, Central Bobonong, and Ngwaketse West.

Access to sources of safe drinking water:

The study shows that about 97.0% of households in Botswana have access to sources of safe drinking water. The highest access to source of safe drinking water was recorded in all cities/towns with figures ranging between 99.9% and 99.7%. All the district recorded 90% and over of households with access to sources of safe drinking water with an exception of the Delta which recorded 52% of households with access. Locality differentials reveals high access in cities/towns and urban villages compared to rural areas.

Principal Household Water Supply for Other Uses:

Similar disparities are observed in access to sources of water for other uses, with urban areas generally exhibiting higher access compared to rural areas. Just like with access to sources of safe water for drinking, districts with comparatively limited access to improved safe water infrastructure for other uses include Barolong, Ngwaketse West, Kweneng West and Ngamiland West. WUC serves as the primary water provider for most households, with alternative sources utilized in some districts.

Type of Toilet Facility Used by Household:

The study highlights significant variations in sanitation facilities, with flush toilets connected to sewer lines being the most common. Ventilated Improved Pit Latrines (VIP) are used by a smaller proportion, accounting for 2.1% while Dry compost toilets (e.g., Enviro loo), represent only 1.1% of the households. About 11.0% of the households reported having no access to any sanitation facility. Districts like Southern, Barolong, Ngwaketse West, Kweneng West, Central Boteti, and Ngamiland West exhibit lower proportions of households with flush toilets.

Access to improved sanitation facilities:

The proportion of households with access to improved sanitation facilities in Botswana stood at 89.0%. The analysis also highlights notable disparities in access to improved sanitation facilities across various districts in Botswana, with the highest access ranging between 98.8% - 100% recorded in Gaborone, Francistown, Selibe Phikwe, Orapa, Jwaneng, and Sowa. Nonetheless, low access to improved sanitation facilities is evident in the CKGR, Delta and Ngamiland West districts. Most of the households reported having no access to improved sanitation facilities. This highlights the significant challenge of inadequate sanitation infrastructure in rural settings, which can have implications for overall well-being.

Availability of Bathrooms in Households:

The availability of bathrooms within households varies significantly across districts and localities, with urban areas generally having higher access compared to rural areas. Districts that have more than 60% of households without basic bathroom facilities include CKGR (88.1%), Kweneng West (73.4%), Ngwaketse West (70.7%), Ngamiland West (69.3%), Central Boteti (65.3%), Kgalagadi South (61.1%) and Kgalagadi North (60.4%). The study underscores the need for improved sanitation infrastructure in rural settings to address health and hygiene concerns.

Conclusion and Policy Implications

The findings of this study underscore the importance of addressing disparities in access to water source infrastructure, sanitation facilities, and bathrooms among households in Botswana. Policy interventions aimed at improving water and sanitation infrastructure, particularly in rural areas, are essential to promote public health and well-being, ensure equitable access to essential services, and mitigate the risks associated with inadequate sanitation facilities.

Introduction and Background

Access to safe water, proper sanitation facilities, and adequate hygiene practices are vital components of sustainable development and the overall well-being of communities. They are essential for promoting public health and ensuring the well-being of communities. These fundamental elements play a crucial role in preventing waterborne diseases, reducing child mortality rates, and improving overall quality of life, hence they are held in high regard by international organisations such the World Health Organisation (WHO),

United Nations Children's Fund (UNICEF), United Nations Statistics Division (UNSD) of the Department for Economic and Social Affairs (DESA), amongst others.

The 2030 Agenda for Sustainable Development Goals (SDGs) through SDG 6 aims to ensure availability and sustainable management of water and sanitation for all and it includes targets for universal access to safe drinking water, sanitation and hygiene (WASH) (UNICEF & WHO, 2023). The provision of the quality Water, Sanitation and Hygiene (WASH) facilities is crucial for combating neglected tropical diseases (NTDs) and other faecal-oral transmitted diseases (UNICEF & WHO, 2015). Access to WASH facilities in developing countries experienced a significant increased over the recent years though it is still below the Sustainable Development Goals (SDG) targets (Inah et al. 2020). The proportion of world population using safely managed sanitation services increased from 28% to 45% between 2000 and 2017, and population using safely managed drinking water services in Least Developed Countries increased from 25% and 35% during the same period (UNICEF & WHO, 2019). In spite of recent improvements, WASH have remained a critical problem across the world (Pravisha & Manoj, 2023). In 2022, 2.2 billion people still lacked safely managed drinking water, 3.5 billion people still lacked safely managed sanitation, and 2 billion people still lacked basic hygiene services. No Sustainable Development Goals (SDG) region was on track to achieve the goal of universal access to safe drinking water by 2030 and the rate of progress would need to increase six fold to meet the SDG global target (UNICEF & WHO, 2023).

Some communities in Botswana continue to have poor hygiene, open defecation, and lack of access to safe drinking water and sanitation systems, among others. For example, in Botswana the percentage of households with access to improved sanitation facilities decreased from 92.7 percent in 2011 to 89.2 percent in 2017, while access to improved water source through tapped/piped water decreased from 90.6 percent in 2011 to 85.2 percent in 2017 (Statistics Botswana, 2020).

As the nation strives to achieve its developmental goals outlined in Botswana Vision 2036 and the Transitional National Development Plan 2 (TNDP 2), it is crucial to assess the state of water supply, sanitation, and hygiene (WASH) practices at the household level. The assessment aligns with the vision's pillar of "Sustainable Economic Development" and its objective of improving the quality of life and well-being of Batswana. It is also directly aligned with the TNDP's objective of improving social welfare, health, and living conditions for the population. The assessment of water supply, sanitation, and hygiene practices in households not only provides valuable insights into the current state of affairs but also facilitates the achievement of Sustainable Development Goal 6 (SDG 6) on Clean Water and Sanitation. SDG 6 aims to ensure universal access to safe and affordable drinking water, improve sanitation facilities, and promote good hygiene practices. Additionally, this assessment aligns with the Africa Agenda 2063 objective of fostering social inclusion, health, and well-being, thereby supporting the broader development agenda.

The Botswana 2022 Population and Housing Census serves as an invaluable resource for understanding the dynamics of households and communities across the country. By utilizing the rich and comprehensive data available in the 2022 PHC, it is possible to analyze the WASH-related indicators, socio-economic factors, and infrastructure distribution specific to Botswana.

Aim and Objectives of the study

The aim of this study is to assess the access to, and distribution of sources of safe drinking water and sanitation facilities among households in Botswana, with a focus on identifying disparities across districts and localities.

Specifically, this study seeks to:

- Establish the main sources of drinking water and for other uses for households in Botswana and analyse the variations in access to source of safe drinking water.
- Investigate the types of toilet facilities used by households in Botswana, and assess the access to improved sanitation facilities by districts and localities.
- Assess the availability of bathrooms within housing units and analyse the variations in access to bathroom facilities by districts and localities, with a focus on urban-rural disparities.
- Explore types of access to toilet and bathroom facilities among households, including exclusive use, sharing arrangements, and communal facilities.

DEFINITION OF KEY CONCEPTS.

WASH: stands for safe drinking water, sanitation and hygiene.

Access to safe drinking water: The WHO/UNICEF Joint Monitoring Programme (JMP) provides a "ladder" or classification of drinking water based on the sources of water, from safely managed sources of water to surface water. The highest class, safely managed, is defined as "from an improved source that is accessible on premises, available when needed and free from faecal and priority chemical contamination." (UNICEF 2024) The lowest class is surface water from unimproved sources such as a river or dam and other such open sources. The World Health Organisation (WHO) defines access to safe drinking water "by the availability of at least 20 litres of water per person per day from a source within 1 kilometre of walking distance.' (WHO 2024). This study defines access to safe drinking water based on the source of drinking water, and includes all treated water and "delivered water" provided to communities. It excludes wells on the assumption that it is not known if they are covered or uncovered. This definition allows for comparison with previous census and surveys data and the continuity of the assessment of access to safe drinking water.

Access to improved sanitation facilities: The WHO/ UNICEF JMP provides a "ladder for sanitation services." The ladder ranges from the highest class of "safely managed" to the lowest class of "open defecation." Safely managed sanitation facilities are "improved facilities that are not shared with other households and where excreta are safely disposed of in situ or removed and treated off-site." (UNICEF 2024). This study looks at access to improved sanitation facilities, where excreta are safely disposed of in situ or removed and treated offsite. The study includes improved facilities which are shared by households as access to improved sanitation facilities. This definition allows for comparison with previous census and surveys data and the continuity of the assessment of access to improved sanitation facilities.

Hygiene: "Hygiene refers to the conditions and practices that help maintain health and prevent spread of disease including hand washing, food hygiene, and menstrual hygiene management." (UNICEF/ WHO JMP 2024). The UNICEF/WHO JMP "service ladder for hygiene" identifies households meeting the criteria for a basic hygiene service as those with a hand washing facility with soap and water available on premises, while those with a "limited" service are those with hand washing facilities but no soap and water. This study assesses access to sanitation based on the availability of, or access to bathroom facilities. The data available does not include the availability of soap. The assessment thus assumes the availability of bathroom facilities to be an indication of access to basic hygiene facilities.

Methodology

The primary data source utilized in this study is the 2022 Population and Housing Census, conducted by Statistics Botswana. This census provides a comprehensive and representative dataset for the study, offering extensive information on various aspects such as the main sources of drinking water and water for other uses in households, types of toilet facilities used by households, availability of bathrooms within households, and patterns of toilet and bathroom usage among households across the country. This dataset allows for a detailed and nuanced analysis of distribution patterns in water source infrastructure and sanitation facilities, enabling the identification of specific policy areas requiring further attention and intervention.

To conduct the analysis, the latest version of SPSS (Statistical Package for the Social Sciences) was utilized. The analysis begins with a descriptive overview of the main sources of drinking water and water for other uses in households, types of toilet facilities used by households, availability of bathrooms within households, and patterns of toilet and bathroom usage among households. Subsequently, the distribution of water source infrastructure and sanitation facilities across census districts and localities is further examined. Descriptive statistics, such as frequencies and percentages, are employed to summarize the types of water source infrastructure and the availability of sanitation facilities. Data visualization methods, including charts and graphs, are used to uncover patterns in the data. Cross-tabulations are utilized to explore the distribution of types of water sources for drinking and other uses, as well as the availability of sanitation facilities, across census districts and localities.

FINDINGS AND DISCUSSIONS

MAIN SOURCE OF DRINKING WATER FOR HOUSEHOLD (PIPED)

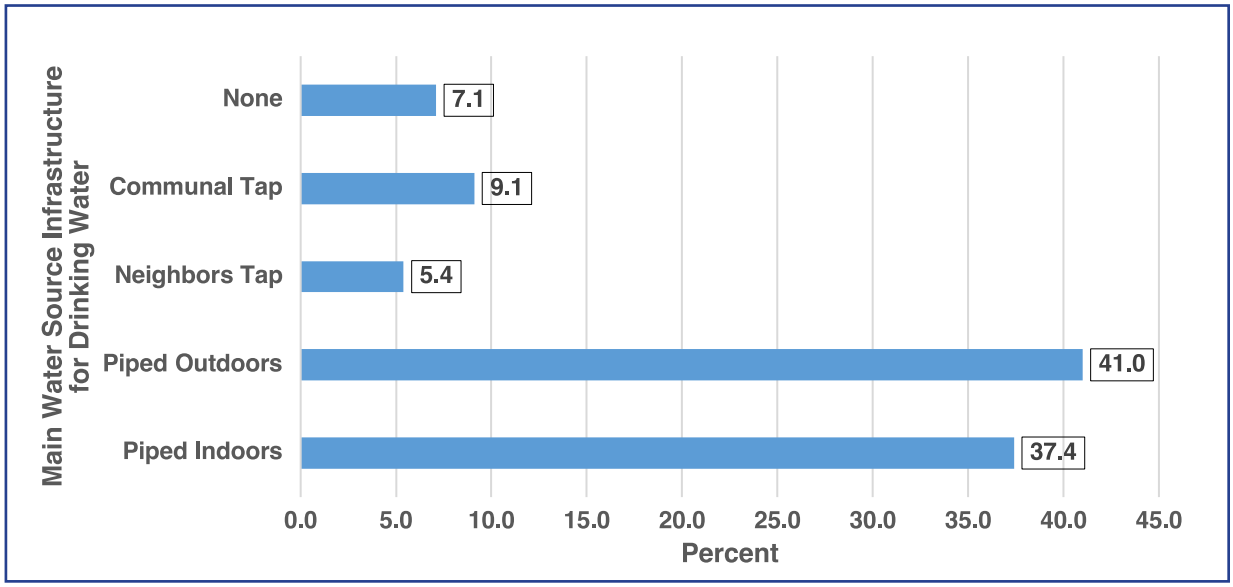
Figure 1 shows the proportion of households by source of main drinking water (piped). Results show that the primary source of piped water for drinking varies among households, with 37.4% having access to piped water indoors, indicating a relatively high level of convenience and hygiene. A significant portion of households, accounting for 55.5%, rely on piped water located outdoors (in the yard, neighbour's yard, and communal tap), still providing convenient access but without the added convenience of indoor plumbing.

Table 1 shows that at national level 92.9% of the households have access to sources of piped water. District differentials reveal that districts with the highest proportions of households with access to sources of piped water are Orapa, Francistown, Selibe Phikwe, and Gaborone and Lobatse with 99.9%, 99.8%, 99.7%, and 99.6 respectively. It is worth noting that these are cities and mining towns which are more urbanized compared to majority of the other districts. The table further shows that the districts exhibiting low access to source of piped water include CKGR, Kweneng West, Central Bobonong, and Ngwaketse West in that ascending order.

Cities/Towns demonstrate the highest proportion (99.6%) of households with access to sources of piped water whilst rural areas present the lowest proportion with 82.3% **(Table 2)**. Furthermore, Urban Villages display a moderate proportion (97.9%) of households with access to sources of piped water. While this proportion is higher than that of rural areas, it is lower than that of cities/towns, suggesting some disparities in access within urban and semi-urban settings.

About 5.4% of the households access water from a neighbour's tap while 9.1% depend on communal taps and 7.1.5 have no access to any source of piped water. There is higher reliance on communal taps in the rural areas (19.8%) than in the cities/towns (0.7%) and urban villages (4.8%) indicating a higher level of access to piped water infrastructure within residential premises in urban areas and the need for improved water infrastructure in rural communities.

FIGURE 1: PROPORTION OF HOUSEHOLDS BY SOURCE OF MAIN DRINKING WATER (PIPED)



ACCESS TO SOURCES OF SAFE DRINKING WATER BY DISTRICT AND LOCALITY

Water is considered safe for drinking when it is sourced from WUC (piped), bouser, tanker, borehole, rainwater tank, and bottled water. **Figures 2-4** and Table 3 present the proportion of households with access to source of safe drinking water by district and loyalty. Figure 2a reveals that the highest proportion of households with access to main source of drinking water is from WUC (84.7%) followed by Tanker (2.5%) and bowser (1.9%) in that order.

In terms of access to safe drinking water the results show that the proportion of households with access to safe drinking water at national level stood at 97.0%. The highest access to source safe drinking water was recorded in all cities and towns with figures ranging between 99.9% and 99.7%. Orapa and Francistown districts recorded the highest access to source of safe drinking water with 99.9% each. Other districts recorded high access to source of safe drinking water with proportions ranging between 99.4% and 91.6%, for South East and Central Bobonong respectively. Low access to source of safe drinking water was recorded in the Delta at 52% **(see Figure 3)**. This is attributed to high dependence on rivers and streams as source of drinking water. It is also worth noting that even though CKGR is rural district and game reserve, it has the highest proportion of households with access to source safe drinking water at 100.0%. The main sources of drinking water include bouser, tanker, and borehole which are considered safe.

Locality differentials reveal that urban villages have the highest access to sources of safe drinking water with a proportion of 99.4% followed by cities/towns (98.1%) and rural areas (93.6%) in that order **(see Figure 3 and Table 4)**. There are more bowsers and tankers as sources of drinking water in urban villages compared to other localities, hence they have a higher proportion of households with access to source of safe drinking water.

FIGURE 2: PROPORTION OF HOUSEHOLDS BY PRINCIPAL WATER SUPPLY SOURCE FOR DRINKING WATER

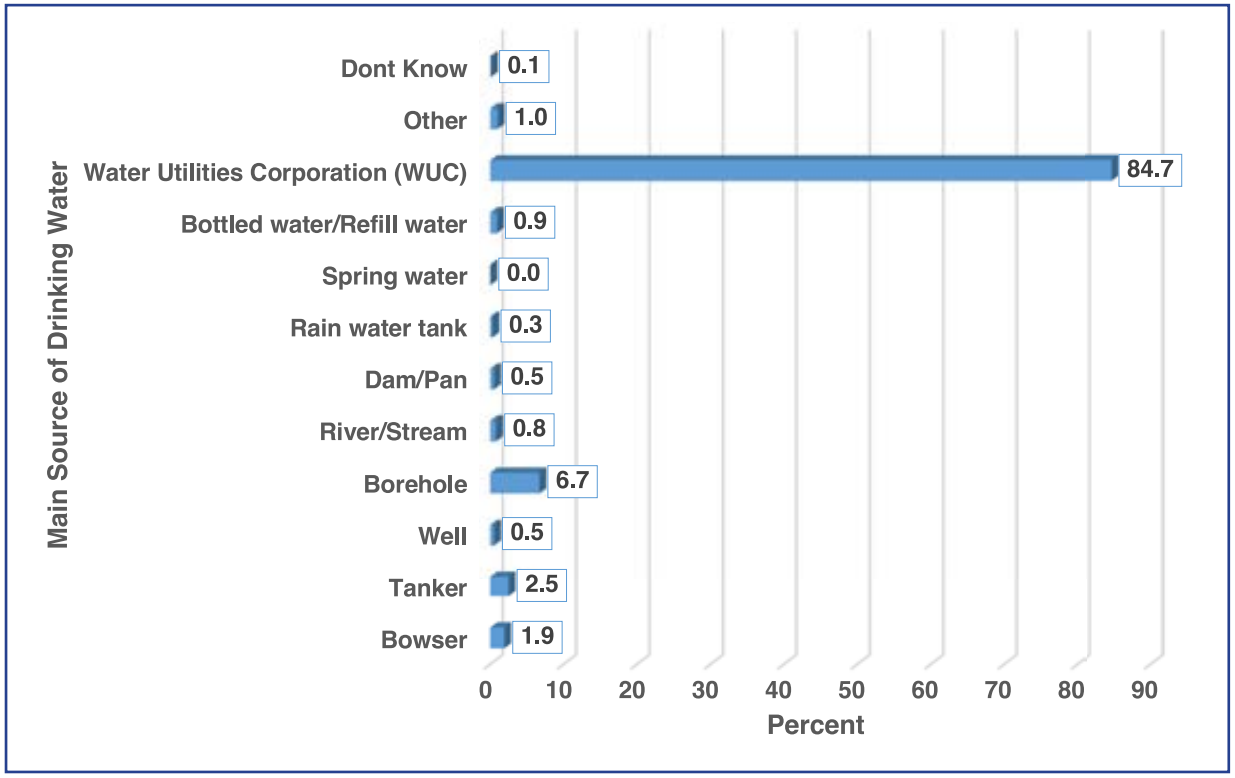


FIGURE 3: HOUSEHOLD ACCESS TO SAFE DRINKING WATER BY DISTRICT

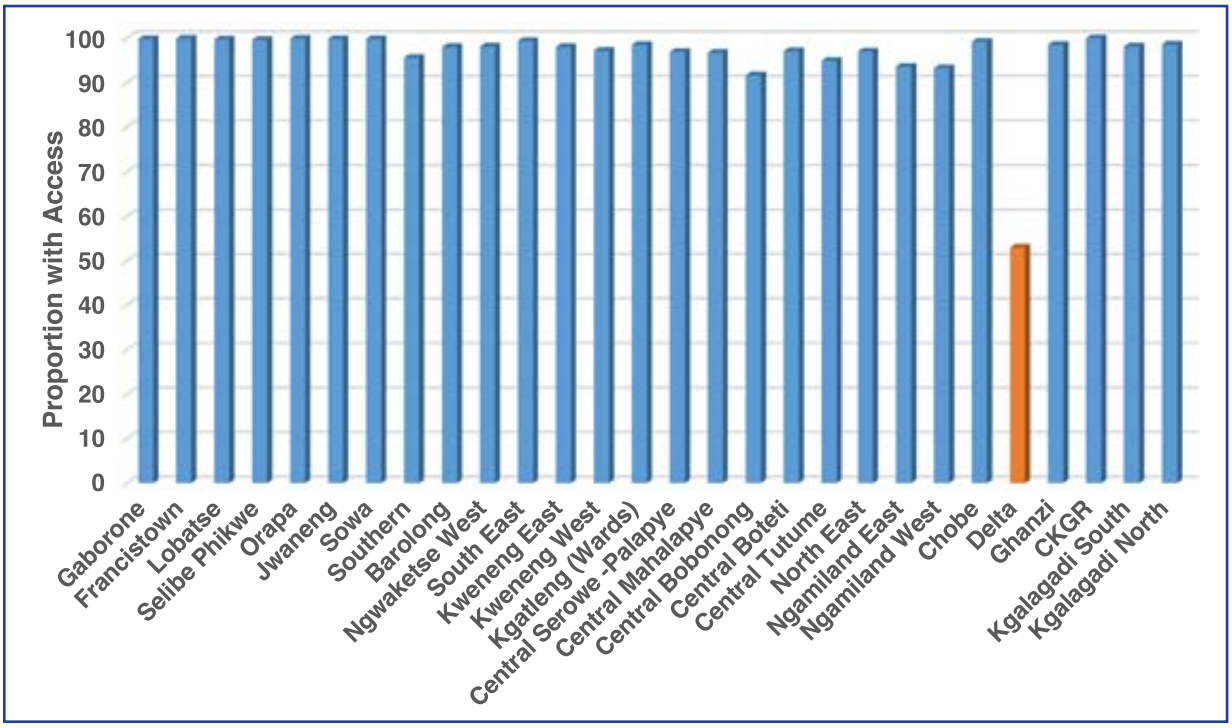
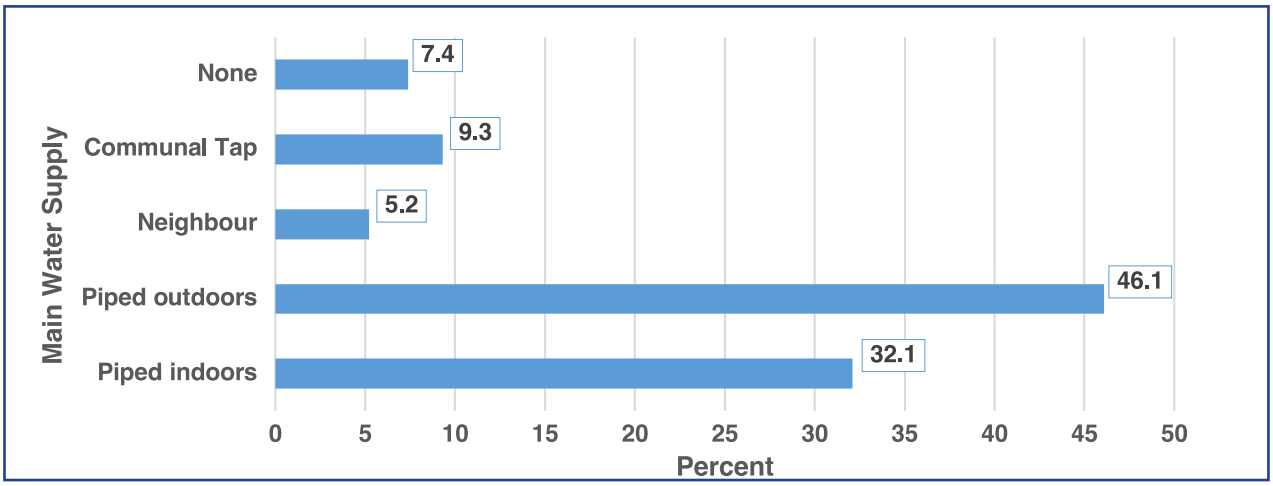


FIGURE 4: HOUSEHOLD ACCESS TO SAFE DRINKING WATER BY LOCALITY

PRINCIPAL HOUSEHOLD WATER SUPPLY FOR OTHER USES

Figure 5 depicts household distribution based on principal water source infrastructure for various uses, indicating notable variability. Approximately 32.1% have indoor piped water, ensuring convenience and hygiene, while 46.1% rely on outdoor (in the yard) piped water.

FIGURE 5: PROPORTION OF HOUSEHOLDS BY PRINCIPAL WATER SOURCE INFRASTRUCTURE FOR OTHER USES



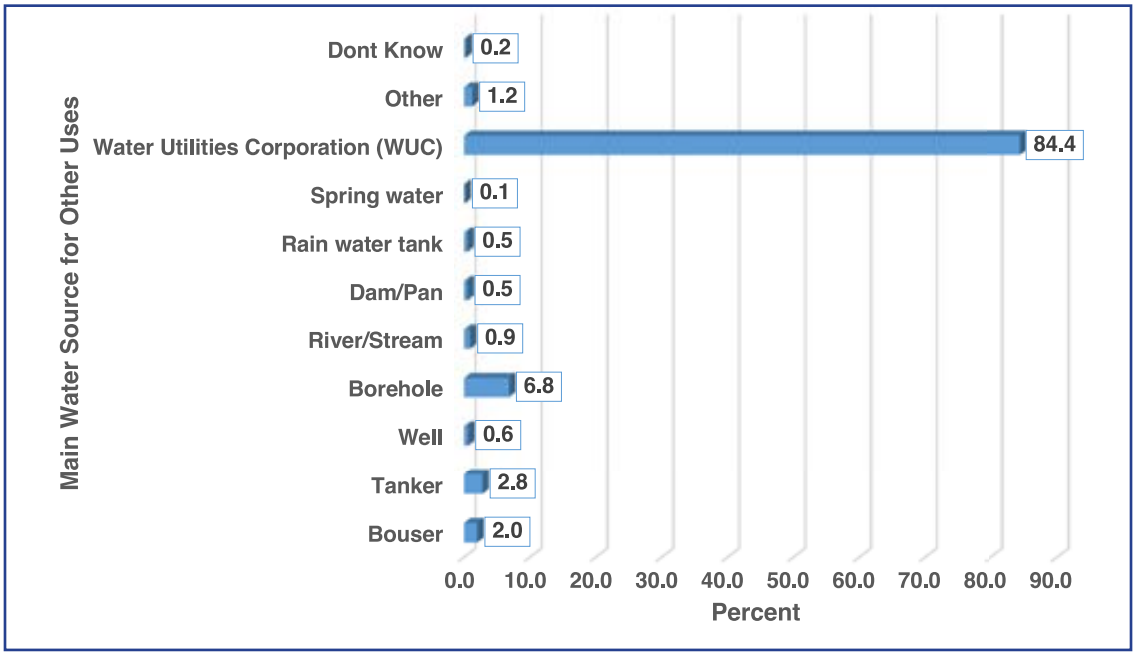
It is evident from the figure that 78.2% of households in Botswana have access to piped water in the yard (indoor and outdoor) **(see Table 5)**. The table also shows that Gaborone, Orapa, Jwaneng and Sowa show significantly higher access (piped water in the yard) compared to other districts.

Table 5 further shows that at national level 92.9% of the households have access to sources of piped water for other uses from indoor taps, outdoor taps, neighbour's tap, and communal tap. District differentials reveal that districts with the highest proportions of households with access to sources of piped water are Orapa, Francistown, Selibe Phikwe, and Gaborone and Lobatse with 99.9%, 99.8%, 99.7%, and 99.6 respectively.

Similar to access to sources of piped drinking water, **Table 6** shows that cities/towns exhibit the highest access to sources of piped water for other uses, rural areas the lowest, and urban villages show moderate access, reflecting disparities **(See Table 6)**. Rural areas particularly depend on communal taps, emphasizing the need for rural water infrastructure development. Conversely, cities/towns rely less on communal taps, indicating better piped water infrastructure access.

Figure 6 shows the proportion of households by principal water supply source for other uses. There is a similar pattern to that of proportion of households by water source infrastructure for drinking water in that WUC remains the main source of water supply for 84.4% of the households, followed by borehole (6.8%), tanker (2.8%) and browser (2%). All these are considered as safe sources of water even for drinking.

FIGURE 6: PROPORTION OF HOUSEHOLDS BY PRINCIPAL WATER SUPPLY SOURCE FOR OTHER USES



Tables 7 and 8 illustrate the percentage distribution of households by principal source of water supply for other uses by district and locality respectively. Table 7 shows that there are apparent disparities in the principal source of water supply for other uses across different districts in Botswana. Notable districts with high access to the WUC as the principal source of water supply for other uses include Gaborone, Francistown, Lobatse, and Selibe Phikwe, with proportions ranging from 96.9% to 99.2%. Conversely, districts like Orapa exhibit low reliance on WUC since 84.2% of households' principal source of water supply for other uses is 'Other', presumably provided by the mine, with 4.5% sourcing water for other uses from boreholes. Other census districts such as CKGR and the Okavango Delta have almost none of the households sourcing water for other uses.

Districts such as Southern, Barolong, and Ngwaketse West demonstrate moderate access levels to WUC, ranging from 70.1% to 74.7%. These districts also display notable proportions of households relying on alternative sources like boreholes, rivers/streams, and communal taps, suggesting varied water sources.

Extreme cases include districts like the Okavango Delta and CKGR, with the Okavango Delta reporting 50.3% reliance on boreholes and CKGR with 76.2% reliance on bouser trucks.

Table 8 reveals significant disparities in the source of water supply for other uses besides drinking water among households across different localities in Botswana. Localities categorized as cities/towns exhibit the highest reliance on WUC as the principal source of water supply for other uses, with a proportion of 95.7%. Conversely, rural areas display comparatively lower reliance on WUC, with only 65.8% of households accessing water from this source. This stark difference underscores the urban-rural disparity in access to centralized water infrastructure.

Urban villages also demonstrate high reliance on WUC, with 94.2% of households accessing water from this source. However, urban villages exhibit slightly higher proportions of households utilizing alternative sources like bousers, tankers, and wells compared to cities/towns, suggesting a greater diversity in water supply sources in these areas. This indicates that access to WUC source by urban villages is still a challenge that requires attention.

Rural areas stand out for their reliance on alternative water sources such as boreholes (18.8%) and rivers/streams (2.3%), indicating a significant dependence on decentralized water supply system. This reliance on alternative sources reflects the challenges of providing centralized water infrastructure in remote rural areas.

TYPE OF TOILET FACILITY USED BY HOUSEHOLD

The primary sanitation facilities in Botswana households vary significantly. **Figure 7** illustrates the proportion of households by type of toilets facility used by household at national level. Flush toilets connected to sewer lines are utilized by 36.1% of households, while flush toilets with septic tanks are used by 13.2%. Pit latrines are a prevalent option, with 36.5% of households relying on them. Ventilated Improved Pit Latrines (VIP) are used by a smaller proportion, accounting for 2.1%. Dry compost toilets, such as Enviro loo, are less common, representing only 1.1% of households. A notable portion of households, 11.0%, do not have any sanitation facilities, indicating a considerable gap in access to proper sanitation infrastructure.

FIGURE 7: PROPORTION OF HOUSEHOLDS BY TYPE OF TOILET FACILITY USED

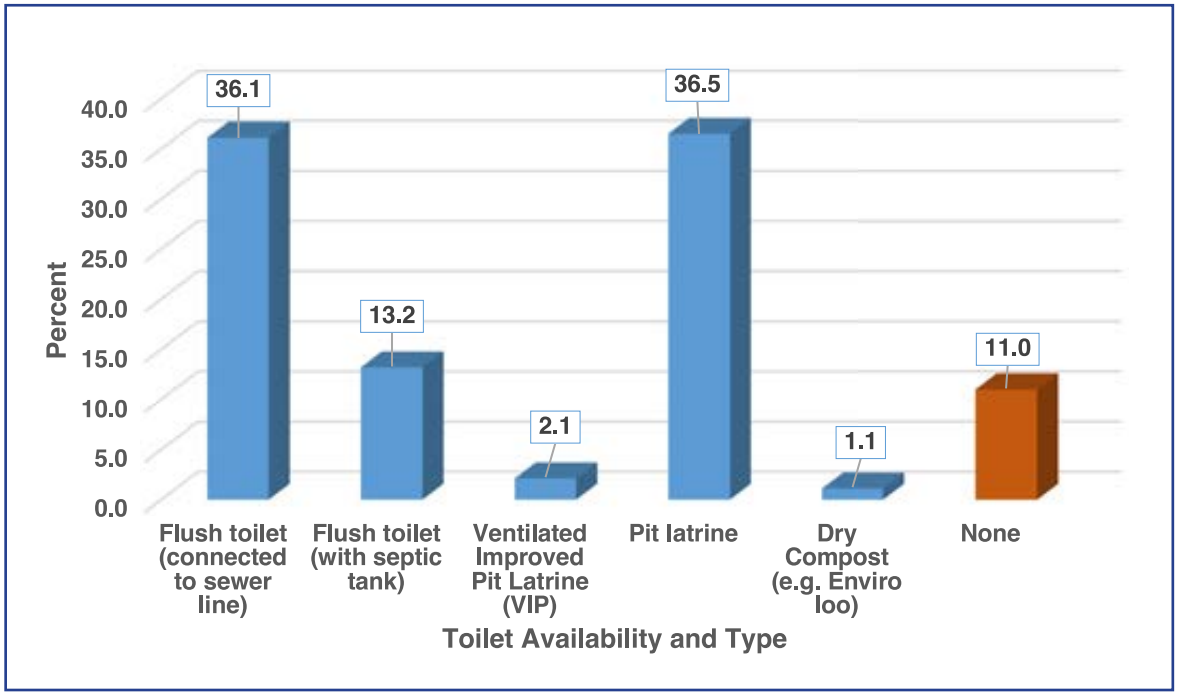


Table 9 in the appendices shows that the distribution of toilet facilities among households in different districts of Botswana highlights significant disparities in sanitation infrastructure. In districts such as Gaborone, Francistown, Selibe Phikwe, Orapa, Jwaneng, and Sowa, the proportion of households with flush toilets connected to the sewer line or with septic tanks is notably higher, ranging from 87.8% to 100.0%. These districts demonstrate relatively better sanitation infrastructure. On the other hand, Lobatse census district, which is categorized as a town, has 61.4% of households with flush toilets connected to the sewer line or with septic tanks.

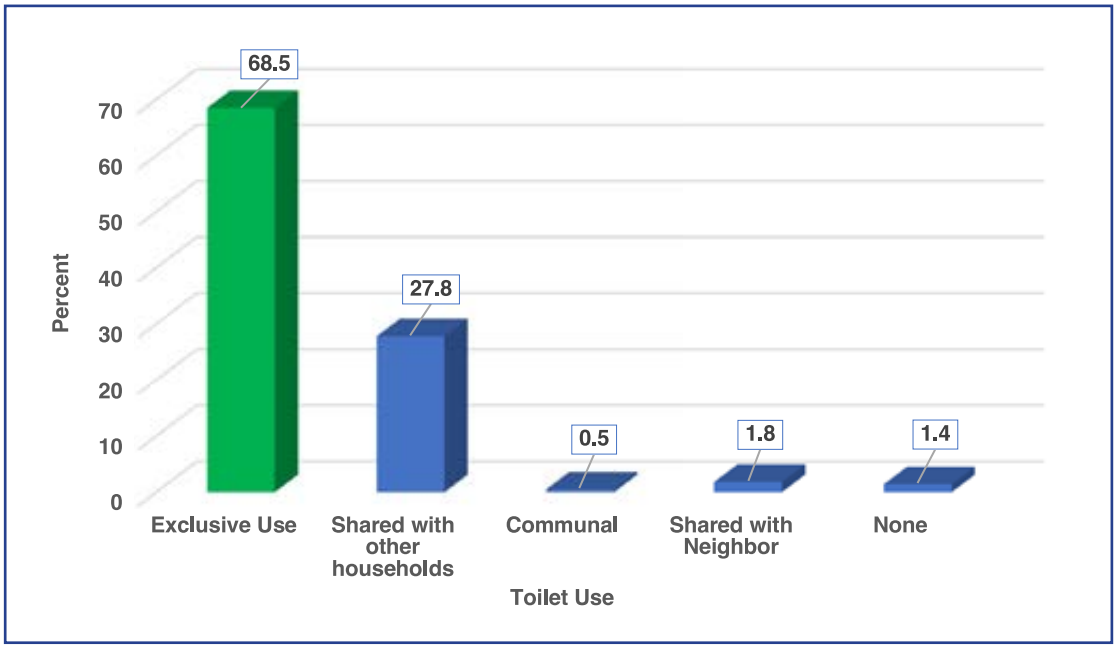
Districts like Southern, Barolong, Ngwaketse West, Kweneng West, Central Boteti, and Ngamiland West exhibit lower proportions of households with flush toilets, with values ranging from 14.4% to 28.2%. Instead, these districts rely more heavily on pit latrines and dry compost toilets, with proportions ranging from 33.1% to 47.5%, indicating less developed sanitation infrastructure and potentially posing health and environmental risks.

Notably, the Okavango Delta district stands out with the highest proportion of households using dry compost toilets (55.0%), highlighting a significant reliance on alternative sanitation methods in this area.

Table 10 in the appendix shows the proportion of households by type of toilet facility being used by locality. Findings indicate significant disparities in the type of toilet facility used by households across different localities in Botswana. In cities and towns, the dominant type of toilet is flush toilet (89.8%) with those connected to sewer at 85.4% and those with septic tank at 4.4%. This indicates a well-developed sanitation system in urban areas. However, in urban villages, only 53.0% of households have access to flush toilets (connected to sewer or with septic tank), while in rural areas, this proportion drops to 19.2%. These findings underscore the evident disparities in access to flush toilets across different localities in Botswana. Urban areas tend to have higher proportions of households with access to flush toilet facilities, while rural areas face challenges in this regard. Efforts to improve sanitation infrastructure in rural areas are crucial to ensure equitable access to essential services for all citizens.

Figure 8 shows the type of access to toilet facilities among households in Botswana, that is, by whether they use the toilet they have exclusively or sharing in any other way. The figure shows that the majority of households (68.5%) use their toilets exclusively, indicating that these facilities are dedicated solely to their own use. However, a significant portion of households (27.8%) share their toilets with other households, suggesting a communal arrangement within communities. A smaller proportion of households (0.5%) utilize communal toilets, likely located in public areas or shared facilities. Additionally, 1.8% of households share their toilets with neighbours, implying a close-knit community arrangement. Notably, 1.4% of households do not have access to any toilet facilities, highlighting a gap in sanitation infrastructure access.

FIGURE 8: PROPORTION OF HOUSEHOLDS BY TYPE OF ACCESS TO TOILET FACILITIES



ACCESS TO IMPROVED SANITATION FACILITIES

Figure 9 and **Table 9** presents proportion of households with access to improved sanitation by district. This includes access to flush toilets (connected to sewer / with septic tank), ventilated pit latrines, pit latrines with slab, and composting toilets (e.g., enviro-loo). The results show that the proportion of households with improved sanitation facilities at national level stood at 89.0%. **Table 9** highlights notable disparities in access to improved sanitation facilities across various districts in Botswana, with the highest access ranging between 98.8% - 100% recorded in Gaborone, Francistown, S/Phikwe, Orapa, Jwaneng and Sowa. This indicates the availability of better sanitation infrastructure. However, low access to improved sanitation facilities is evident in the CKGR, Delta and Ngamiland West districts with the proportion of households' access ranging between 11.9% - 52.9%. Most of the households reported having no access to improved sanitation facilities.

Additionally, the proportion of households with access to improved sanitation facilities is notably higher in urban areas compared to rural areas. In Cities/Towns and Urban villages the proportion of access to improved sanitation facilities is high with 99.5% and 97.3% respectively, while in rural, this proportion is considerably lower at 71.8% **(Figure 10).** This highlights the significant challenge of inadequate sanitation infrastructure in rural settings, which can have implications for overall well-being.

FIGURE 9: HOUSEHOLD ACCESS TO IMPROVED SANITATION FACILITIES BY DISTRICT

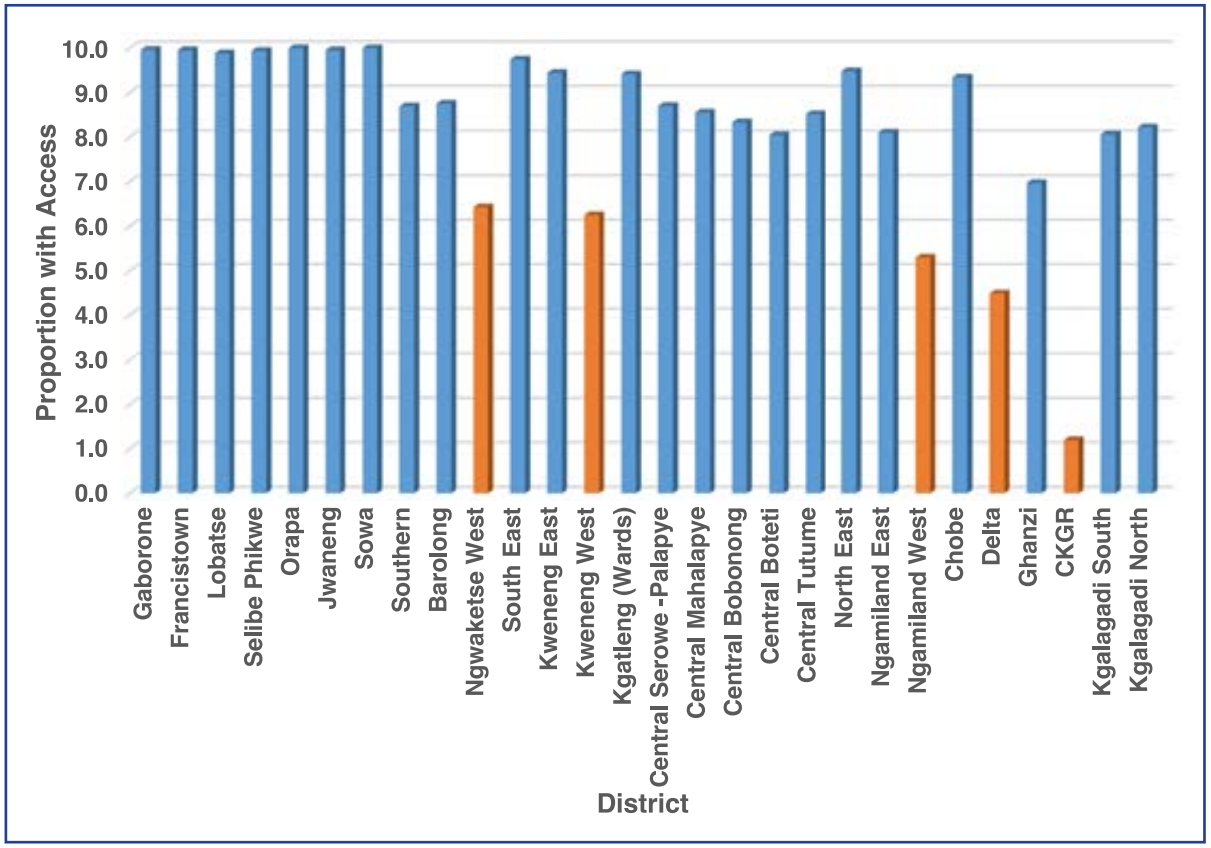


FIGURE 10: HOUSEHOLD ACCESS TO IMPROVED SANITATION FACILITIES BY LOCALITY

AVAILABILITY OF BATHROOMS IN HOUSEHOLDS

The availability of bathrooms in Botswana households varies significantly. **Figure 11** shows the proportion of household by type of bathroom available. About 41.3% of households have a bathroom available with a fixed bath or shower within the housing unit. Additionally, 6.4% of households have a bathroom available without a fixed bath or shower within the housing unit, while 1.6% have a bathroom available with a fixed bath or shower outside the housing unit. Another 2.0% of households have a bathroom available without a fixed bath or shower outside the housing unit. However, a significant portion, 48.6% of households, do not have a bathroom available at all.

FIGURE 11: PROPORTION OF HOUSEHOLDS BY PATTERNS OF USE OF TOILET THEY HAVE ACCESS TO.

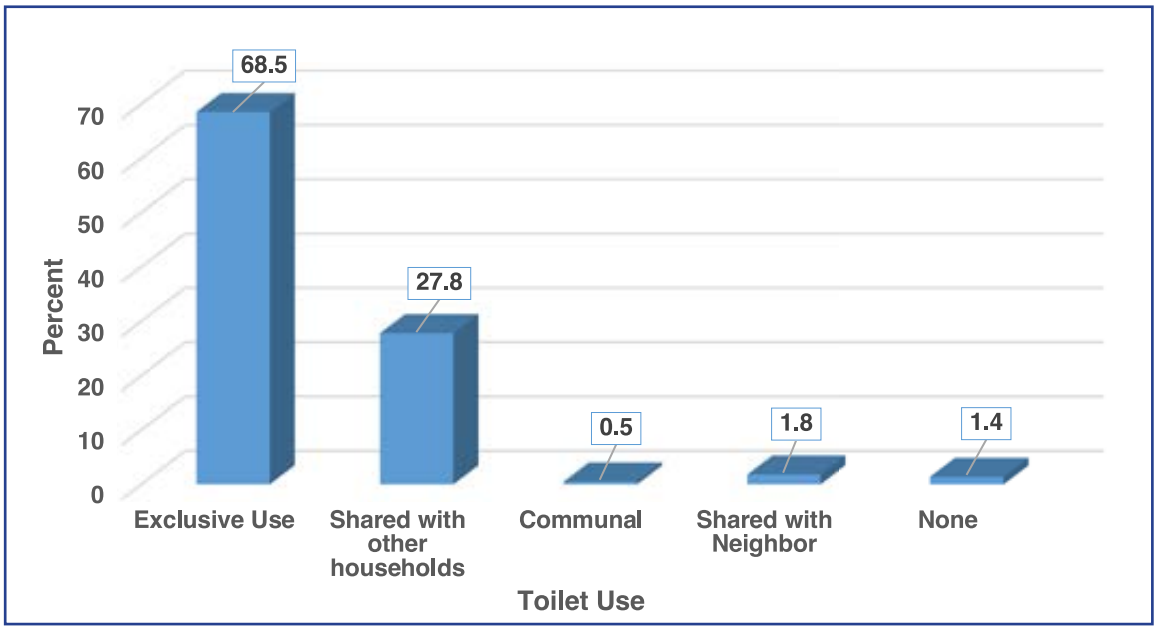


FIGURE 12: PROPORTION OF HOUSEHOLDS BY TYPE OF BATHROOM AVAILABLE

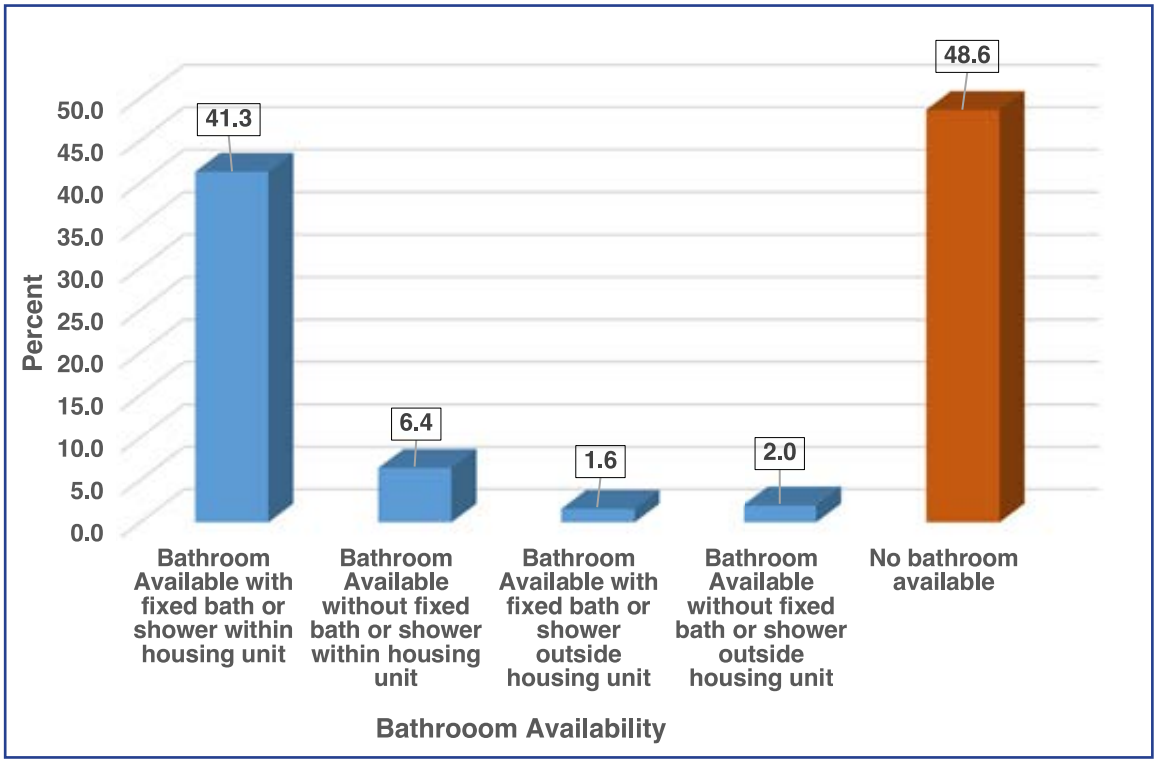


Table 11 shows proportions of households by type of bathroom available and districts. The findings highlight notable disparities in the availability of bathroom facilities across various districts in Botswana. In districts such as Orapa, Sowa, and Jwaneng, nearly all households have access to bathrooms with fixed baths or showers within the housing unit, with proportions ranging from 98.7% to 99.1%. Conversely, districts like the Okavango Delta, CKGR, Ngamiland West, Kweneng West and Ngwaketse West exhibit substantially lower proportions of households with access to such facilities, with values ranging from 1.6% to 19.6%. Notably, the Okavango Delta district stands out with the highest proportion of households lacking basic bathroom facilities within their housing units at 92.7%. In addition to the Okavango Delta census district, districts that have more than 60% of households without basic bathroom facilities include CKGR (88.1%), Kweneng West (73.4%), Ngwaketse West (70.7%), Ngamiland West (69.3%), Central Boteti (65.3%), Kgalagadi South (61.1%) and Kgalagadi North (60.4%).

Table 12 reveals significant disparities in the types of bathrooms available across different localities in Botswana. In urban areas such as Cities/Towns and Urban Villages, a higher proportion of households have access to bathrooms with fixed baths or showers within the housing unit compared to rural areas. Specifically, in Cities/Towns, 64.1% of households have a bathroom with a fixed bath or shower within the housing unit, whereas in Urban Villages, this proportion is slightly lower at 46.7%. Conversely, in rural areas, only 20.0% of households have access to bathrooms with fixed baths or showers within the housing unit, indicating a stark contrast in access to improved bathroom facilities between urban and rural localities.

Additionally, the proportion of households with no bathroom available is notably higher in rural areas compared to urban areas. In Rural areas, 67.5% of households lack access to any bathroom facilities, while in Cities/Towns and Urban Villages, this proportion is considerably lower at 31.1% and 42.5%, respectively. This highlights the significant challenge of inadequate sanitation infrastructure in rural settings, which can have implications for health, hygiene, and overall well-being.

Furthermore, the data indicates that households in Urban Villages have a higher proportion of bathrooms available outside the housing unit compared to other localities. This suggests that while access to improved bathroom facilities within the housing unit is relatively lower in Urban Villages compared to Cities/Towns, there may be shared or communal bathroom facilities available outside the housing units to serve multiple households.

POLICY IMPLICATIONS

The findings regarding the main source of safe drinking water for households in Botswana have several policy implications.

Addressing Disparities in Water Infrastructure: There are significant differences in access to enhanced safe water infrastructure among districts and localities, emphasizing the urgent need for targeted policies to address these disparities. In areas with limited access, such as Barolong, Ngwaketse West, Kweneng West, Ngamiland West, Delta and CKGR, prioritizing investment in water infrastructure development is crucial to ensure equitable access to safe and reliable water for all households. The stark differences in access between urban and rural areas emphasize the urban-rural disparity in water infrastructure. Policy interventions should focus on rural water infrastructure development, including the expansion of piped water networks and the promotion of sustainable alternative water sources, to improve access in rural communities. They should also aim to bridge this gap by prioritizing rural water infrastructure projects and ensuring equitable access to clean water for rural populations. Additionally, efforts should be made to enhance access to centralized water infrastructure in urban villages, where reliance on alternative water sources is still significant. These policy implications align with the objectives of the 2010 Revised National Population Policy (RNPP), National Development Plan (NDP), Vision 2036, Sustainable Development Goals (SDGs), and Agenda 2063, which prioritize access to clean water and sanitation as essential components of sustainable development and public health. By implementing targeted policies and interventions, Botswana can make significant progress towards achieving these national and international development goals, ensuring a healthier and more prosperous future for all its citizens.

Diversification of Water Supply Sources: The reliance on a single water supply source, such as the Water Utilities Corporation, poses risks to water security, especially in areas prone to water scarcity or supply disruptions. Policies should promote the diversification of water supply sources, including the development of alternative sources like boreholes and the implementation of decentralized water supply systems, to enhance resilience against water shortages and ensure reliable access to water for all households.

Addressing Disparities in Sanitation and Bathroom Infrastructure the findings on the types of toilet facilities used, access to improved sanitation facilities, and the availability of bathrooms and type of access to bathrooms in Botswana households underscore the urgent need for targeted policies aimed at addressing disparities in sanitation infrastructure. With significant variations observed across districts and localities, particularly in access to flush toilets connected to sewer lines or with septic tanks and bathrooms with fixed baths or showers within housing units, there is a critical policy imperative to prioritize investment in sanitation infrastructure development. This prioritization is especially crucial in areas with limited access. Such interventions should aim to promote the adoption of improved sanitation and bathroom facilities to mitigate potential health and environmental risks associated with reliance on pit latrines, dry compost toilets, and communal arrangements. These policy efforts align with Botswana's national development agenda, including the 2010 Revised National Population Policy, the National Development Plan, Vision 2036, and the Sustainable Development Goals (SDGs), particularly Goal 6 on clean water and sanitation. Additionally, addressing disparities in sanitation infrastructure and bathroom availability across urban, rural, and urban village settings is crucial to ensure equitable access to essential services for all residents, aligning with the broader objectives of Agenda 2063 to promote inclusive and sustainable development across Africa. Efforts to improve sanitation infrastructure in rural areas are particularly critical to bridge the urban-rural divide and achieve universal access to improved facilities, thereby enhancing health, hygiene, and overall well-being for all Botswana residents.

CONCLUSION

The census analysis on water and sanitation infrastructure in Botswana reveals significant disparities in access across districts and localities. While a significant proportion of households have access to safe drinking water in urban and rural areas, some rural districts face challenges in accessing reliable and sources of safe drinking water. Similarly, access to improved sanitation facilities and bathrooms, varies significantly, with urban areas generally exhibiting better infrastructure compared to rural areas. The findings underscore the urgent need for targeted policies and interventions to address these disparities and improve water and sanitation infrastructure across Botswana. Access to clean water and sanitation is fundamental to public health and well-being, and addressing these challenges is crucial for achieving sustainable development goals.

The findings from this research will not only contribute to the existing knowledge base but also inform policymakers, public health practitioners, and relevant stakeholders in developing targeted interventions and policy frameworks for improving WASH practices.

Limitations of the study

This study examined the access to safe drinking water, improved sanitation and hygiene facilities in Botswana. The study's key limitations are related to the definitions of the assessed access to WASH facilities, more so in the hygiene perspective. The study is dependent on secondary data that allows an assessment of WASH based on access to infrastructural facilities that promote WASH. While the study's assessment of access to safe drinking water and sanitation is closely linked or related to international standards or classification, specifically those provided by UNICEF/WHO JMP, the assessment of hygiene is based on a proxy, namely access to bathroom facilities, which are not an exact match to the UNICEF/WHO JMP classifications, which use the availability of specific handwashing facilities and soap.

Access to piped water in the yard allows greater access to the minimum volume of water required for human well-being, while access to improved toilet facilities on-site allows access to basic sanitation required for human and environmental health. The relationship between access to piped water on-site (infrastructure) and access to safe drinking water is indicatively strong, while that between access to bathroom facilities and hygiene is less so or at least less tested. A better indicator for the assessment of hygiene, used by UNICEF/WHO JMP, is that of the presence of hand washing facilities and soap. The census data does not provide data on the presence of basins and soap for hand washing in particular. It provides an insight into the availability of private bathrooms and the sharing of such facilities, indoors or outdoors. This is used as a proxy for the availability or the provision of facilitates for handwashing, as well as for personal hygiene. It should be noted too that while the definition of hygiene in this study is premised on the UNICEF/WHO JMP's classifications, hygiene remains a concept that is broader than the availability of hand washing facilities such as clean water, a basin and soap. Hygiene is about the actual practice of handwashing, personal hygiene, and menstrual hygiene for which data is limited or extremely difficult to gather using population and housing census.

Recommendations

For Botswana to improve public health, enhance quality of life, and advance sustainable development goals for all its residents, prioritizing equitable access to clean water and sanitation infrastructure is crucial. We therefore recommend the implementation of the following:

Investment in Infrastructure: Prioritize investment in water and sanitation infrastructure development, especially in rural districts with limited access. This includes the following:

Focus on rural water infrastructure projects, including expansion of water networks, improving sanitation facilities, and promotion of sustainable alternative water sources to improve access in rural communities. Promoting the adoption of improved technologies should be prioritized.

Ensure equitable access to clean water for rural populations by bridging the gap between urban and rural areas through targeted policy interventions.

Enhance access to centralized water infrastructure in urban villages to reduce reliance on alternative water sources.

Community Engagement: Foster community engagement and participation in water and sanitation initiatives to ensure the sustainability and effectiveness of interventions. Engaging local communities can help identify specific needs and tailor solutions to address them effectively.

Policy Alignment: Ensure alignment with national development frameworks such as the Revised National Policy on Sanitation, the National Development Plan, Vision 2036, and the Sustainable Development Goals (SDGs). Policies should prioritize universal access to clean water and sanitation facilities as essential components of inclusive and sustainable development.

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APPENDICES

TABLE 1: Proportion of Households by Principal Water Source Infrastructure for Drinking Water by District.

CENSUS DISTRICT	PRINCIPAL WATER SOURCE INFRASTRUCTURE						TOTAL
	PIPED INDOORS	PIPED OUTDOORS	NEIGHBOURS TAP	COMMUNAL TAP	NONE	ACCESS TO SAFE DRINKING WATER	
Gaborone	65.8	31.9	1.1	0.8	0.4	99.8	82,412
Francistown	54.4	42.2	2.3	0.9	0.2	99.9	33,809
Lobatse	47.6	45.8	6.0	0.3	0.4	99.7	9,839
Selibe Phikwe	60.4	36.1	2.6	0.6	0.3	99.6	13,329
Orapa	98.8	1.1	0.0	0.0	0.1	99.9	3,048
Jwaneng	79.7	17.1	0.6	0.2	2.4	99.8	6,586
Sowa	94.2	4.0	0.0	0.1	1.7	99.8	1,106
Southern	22.0	41.8	5.8	16.9	13.5	95.6	37,806
Barolong	17.1	35.2	8.6	27.8	11.3	98.o	16,498
Ngwaketse West	15.5	39.0	16.9	14.4	14.3	98.1	6,588
South East	52.2	38.2	0.9	5.8	2.9	99.4	36,326
Kweneng East	33.9	45.7	3.3	9.1	8.0	98.0	100,723
Kweneng West	17.0	34.6	17.3	14.5	16.7	97.2	15,920
Kgatleng (Wards)	39.7	45.2	2.5	6.1	6.5	98.5	36537
Central Serowe -Palapye	35.4	45.3	6.5	4.4	8.4	96.9	56,987
Central Mahalapye	25.9	43.3	8.1	13.5	9.3	96.7	36,681
Central Bobonong	28.6	44.9	7.3	3.8	15.3	91.6	22,211
Central Boteti	21.1	46.1	8.8	13.7	10.3	97.1	21,258
Central Tutume	26.0	42.1	7.0	15.2	9.7	94.9	46,626
North East	40.2	45.6	6.1	5.4	2.7	97.0	20,911
Ngamiland East	25.6	42.6	8.3	11.7	11.7	93.6	31,582
Ngamiland West	14.1	27.9	9.1	39.2	9.7	93.2	17,921
Chobe	34.7	49.4	3.3	10.2	2.4	99.2	10,123
Delta	1.0	1.0	0.0	95.3	2.6	52.9	191
Ghanzi	29.1	43.0	10.1	10.2	7.6	98.5	15,143
CKGR	9.5	1.2	0.0	1.2	88.1	100.0	84
Kgalagadi South	25.0	46.0	12.1	10.6	6.3	98.1	9,745
Kgalagadi North	26.6	46.1	11.0	8.5	7.7	98.6	7,171
TOTAL	**37.4**	**41.0**	**5.4**	**9.1**	**7.1**	**97.0**	**697,161**

TABLE 2: Proportion of Households by Principal Water Source Infrastructure for Drinking Water by Locality

LOCALITY	PRINCIPAL WATER SOURCE INFRASTRUCTURE						TOTAL
	PIPED INDOORS	PIPED OUTDOORS	NEIGHBOURS TAP	COMMUNAL TAP	NONE	ACCESS TO SAFE DRINKING WATER	
Cities/Towns	63.1	34.0	1.7	0.7	0.4	98.1	150,129
Urban Village	41.5	48.0	3.5	4.8	2.1	99.4	307,185
Rural	16.2	36.2	10.1	19.8	17.7	93.6	239,847
TOTAL	**37.4**	**41.0**	**5.4**	**9.1**	**7.1**	**97.0**	**697,161**

TABLE 3: Proportion of Households by Principal Water Supply Source for Drinking Water by District

CENSUS DISTRICT	PRINCIPAL WATER SUPPLY SOURCE												TOTAL
	WATER UTILITIES CORPORATION (WUC)	BOUSER	TANKER	WELL	BOREHOLE	RIVER/ STREAM	DAM/ PAN	RAINWATER TANK	SPRING WATER	BOTTLED WATER/ REFILL WATER	OTHER	DON'T KNOW	
Gaborone	96.9	0.8	0.4	0.0	0.1	0.0	0.0	0.0	0.0	1.6	0.1	0.0	82,412
Francistown	99.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.3	0.1	0.0	33,809
Lobatse	98.4	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.0	0.1	0.2	9,839
Selibe Phikwe	99.2	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	13,329
Orapa	10.9	0.0	0.0	0.0	4.5	0.0	0.1	0.0	0.0	0.3	84.2	0.0	3,048
Jwaneng	90.7	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	8.7	0.2	0.0	6,586
Sowa	94.4	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.0	4.8	0.3	0.0	1,106
Southern	74.7	4.5	6.2	0.4	8.4	0.6	2.1	0.8	0.1	1.0	1.3	0.0	37,806
Barolong	73.2	7.0	4.8	0.5	11.7	0.1	0.6	0.8	0.0	0.5	0.6	0.1	16,498
Ngwaketse West	70.1	8.0	3.1	0.2	15.9	0.0	0.2	0.5	0.0	0.5	1.4	0.0	6,588
South East	91.6	1.1	1.9	0.1	3.4	0.1	0.2	0.2	0.0	1.2	0.2	0.1	36,326
Kweneng East	82.4	3.3	5.5	0.2	5.6	0.3	0.7	0.3	0.0	0.9	0.8	0.0	100,723
Kweneng West	67.4	1.0	2.7	0.4	24.7	0.0	0.4	0.5	0.0	0.9	1.4	0.6	15,920
Kgatleng (Wards)	83.3	1.4	3.8	0.4	8.9	0.2	0.4	0.5	0.0	0.6	0.4	0.0	36,537
Central Serowe -Palapye	84.8	0.8	1.3	0.6	9.3	0.2	1.3	0.2	0.0	0.5	0.8	0.1	56,987
Central Mahalapye	75.5	3.9	3.2	0.8	13.2	1.6	0.2	0.2	0.0	0.7	0.5	0.1	36,681
Central Bobonong	79.5	0.5	0.9	2.9	10.1	4.5	0.6	0.2	0.0	0.4	0.4	0.0	22,211
Central Boteti	82.0	1.2	1.5	1.1	9.9	1.0	0.1	0.3	0.1	2.2	0.7	0.1	21,258
Central Tutume	84.2	1.0	1.9	1.6	6.9	1.8	0.8	0.4	0.1	0.5	0.5	0.1	46,626
North East	91.9	1.1	1.5	0.1	2.0	1.8	0.6	0.1	0.0	0.4	0.5	0.0	20,911
Ngamiland East	81.4	1.5	3.2	0.7	5.9	4.2	0.3	0.4	0.0	1.2	1.1	0.1	31,582
Ngamiland West	84.5	1.0	0.7	1.9	6.2	3.6	0.0	0.3	0.1	0.5	0.8	0.2	17,921
Chobe	89.5	0.4	0.8	0.1	7.4	0.2	0.0	0.3	0.1	0.8	0.4	0.0	10,123
Delta	0.0	0.0	0.5	1.0	50.3	46.1	0.0	2.1	0.0	0.0	0.0	0.0	191
Ghanzi	73.0	2.3	3.4	0.3	17.9	0.0	0.4	0.5	0.1	1.4	0.5	0.2	15,143
CKGR	0.0	76.2	8.3	0.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84
Kgalagadi South	81.9	3.2	2.9	0.3	9.5	0.0	0.2	0.3	0.0	0.3	1.1	0.1	9,745
Kgalagadi North	87.3	1.7	3.9	0.1	4.5	0.0	0.0	0.5	0.0	0.7	1.2	0.1	7,171
TOTAL	**84.7**	**1.9**	**2.5**	**0.5**	**6.7**	**0.8**	**0.5**	**0.3**	**0.0**	**0.9**	**1.0**	**0.1**	**697,161**

TABLE 4: Proportion of Households by Principal Water Supply Source for Drinking Water by Locality

LOCALITY	PRINCIPAL WATER SUPPLY SOURCE												TOTAL
	WATER UTILITIES CORPORATION (WUC)	BOUSER	TANKER	WELL	BOREHOLE	RIVER/ STREAM	DAM/ PAN	RAINWATER TANK	SPRING WATER	BOTTLED WATER/ REFILL WATER	OTHER	DON'T KNOW	
Cities/Towns	95.7	0.5	0.3	0.0	0.2	0.0	0.0	0.0	0.0	1.4	1.8	0.0	**150,129**
Urban Village	94.2	1.5	2.2	0.0	0.4	0.1	0.1	0.1	0.0	1.0	0.5	0.1	**307,185**
Rural	65.8	3.3	4.4	1.5	18.8	2.3	1.4	0.7	0.1	0.6	1.0	0.1	**239,847**
TOTAL	84.7	1.9	2.5	0.5	6.7	0.8	0.5	0.3	0.0	0.9	1.0	0.1	**697,161**

TABLE 5: Proportion of Households by Principal Water Source Infrastructure for Other Uses by District.

CENSUS DISTRICT	PRINCIPAL WATER SOURCE INFRASTRUCTURE					TOTAL
	PIPED INDOORS	PIPED OUTDOORS	NEIGHBOURS TAP	COMMUNAL TAP	NONE	
Gaborone	59.3	37.8	1.0	0.9	1.0	**82,412**
Francistown	47.9	48.3	2.1	1.1	0.6	**33,809**
Lobatse	46.1	48.3	4.9	0.3	0.4	**9,839**
Selibe Phikwe	51.9	44.4	2.4	0.6	0.6	**13,329**
Orapa	94.6	4.9	0.0	0.1	0.4	**3,048**
Jwaneng	75.5	21.6	2.0	0.2	0.7	**6,586**
Sowa	80.1	19.9	0.0	0.0	0.0	**1,106**
Southern	18.1	45.9	5.8	16.3	13.9	**37,806**
Barolong	14.1	37.8	8.4	27.5	12.3	**16,498**
Ngwaketse West	12.5	42.5	15.4	15.3	14.4	**6,588**
South East	43.7	46.3	1.1	5.6	3.3	**36,326**
Kweneng East	28.5	50.0	3.4	9.3	8.7	**100,723**
Kweneng West	15.5	36.8	16.9	14.8	16.0	**15,920**
Kgatleng (Wards)	32.4	52.4	2.4	6.2	6.6	**36,537**
Central Serowe -Palapye	28.6	52.0	6.5	4.8	8.2	**56,987**
Central Mahalapye	20.2	48.5	7.7	14.1	9.5	**36,681**
Central Bobonong	23.1	49.9	7.1	4.2	15.7	**22,211**
Central Boteti	17.9	50.6	8.2	13.8	9.6	**21,258**
Central Tutume	21.3	46.8	6.7	15.5	9.7	**46,626**
North East	31.8	53.2	5.9	6.0	3.2	**20,911**
Ngamiland East	22.6	46.5	7.6	11.8	11.5	**31,582**
Ngamiland West	12.5	29.0	8.3	40.5	9.7	**17,921**
Chobe	32.4	51.9	3.1	10.3	2.3	**10,123**
Delta	1.0	1.6	0.0	94.2	3.1	**191**
Ghanzi	25.3	46.8	9.6	10.5	7.9	**15,143**
CKGR	10.7	1.2	0.0	1.2	86.9	**84**
Kgalagadi South	21.3	49.3	11.8	11.4	6.1	**9,745**
Kgalagadi North	22.8	50.4	10.3	8.9	7.6	**7,171**
TOTAL	32.1	46.1	5.2	9.3	7.4	**697,161**

TABLE 6: Proportion of Households by Principal Water Source Infrastructure for Other Uses by Locality

LOCALITY	PRINCIPAL WATER SOURCE INFRASTRUCTURE					TOTAL
	PIPED INDOORS	PIPED OUTDOORS	NEIGHBOURS TAP	COMMUNAL TAP	NONE	
Cities/Towns	56.8	39.9	1.7	0.8	0.8	**150,129**
Urban Village	34.6	54.6	3.4	5.0	2.3	**307,185**
Rural	13.3	39.1	9.7	20.1	17.9	**239,847**
TOTAL	**32.1**	**46.1**	**5.2**	**9.3**	**7.4**	**697,161**

TABLE 7: Proportion of Households by Principal Water Supply Source for Other Uses by District

CENSUS DISTRICT	PRINCIPAL WATER SUPPLY SOURCE												TOTAL
	WATER UTILITIES CORPORATION (WUC)	BOUSER	TANKER	WELL	BOREHOLE	RIVER/ STREAM	DAM/ PAN	RAINWATER TANK	SPRING WATER	BOTTLED WATER/ REFILL WATER	OTHER	DON'T KNOW	
Gaborone	96.9	0.8	0.4	0.0	0.1	0.0	0.0	0.0	0.0	1.6	0.1	0.0	**82,412**
Francistown	99.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.3	0.1	0.0	**33,809**
Lobatse	98.4	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.0	0.1	0.2	**9,839**
Selibe Phikwe	99.2	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	**13,329**
Orapa	10.9	0.0	0.0	0.0	4.5	0.0	0.1	0.0	0.0	0.3	84.2	0.0	**3,048**
Jwaneng	90.7	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.1	8.7	0.2	0.0	**6,586**
Sowa	94.4	0.2	0.1	0.0	0.0	0.0	0.0	0.3	0.0	4.8	0.3	0.0	**1,106**
Southern	74.7	4.5	6.2	0.4	8.4	0.6	2.1	0.8	0.1	1.0	1.3	0.0	**37,806**
Barolong	73.2	7.0	4.8	0.5	11.7	0.1	0.6	0.8	0.0	0.5	0.6	0.1	**16,498**
Ngwaketse West	70.1	8.0	3.1	0.2	15.9	0.0	0.2	0.5	0.0	0.5	1.4	0.0	**6,588**
South East	91.6	1.1	1.9	0.1	3.4	0.1	0.2	0.2	0.0	1.2	0.2	0.1	**36,326**
Kweneng East	82.4	3.3	5.5	0.2	5.6	0.3	0.7	0.3	0.0	0.9	0.8	0.0	**100,723**
Kweneng West	67.4	1.0	2.7	0.4	24.7	0.0	0.4	0.5	0.0	0.9	1.4	0.6	**15,920**
Kgatleng (Wards)	83.3	1.4	3.8	0.4	8.9	0.2	0.4	0.5	0.0	0.6	0.4	0.0	**36,537**
Central Serowe -Palapye	84.8	0.8	1.3	0.6	9.3	0.2	1.3	0.2	0.0	0.5	0.8	0.1	**56,987**
Central Mahalapye	75.5	3.9	3.2	0.8	13.2	1.6	0.2	0.2	0.0	0.7	0.5	0.1	**36,681**
Central Bobonong	79.5	0.5	0.9	2.9	10.1	4.5	0.6	0.2	0.0	0.4	0.4	0.0	**22,211**
Central Boteti	82.0	1.2	1.5	1.1	9.9	1.0	0.1	0.3	0.1	2.2	0.7	0.1	**21,258**
Central Tutume	84.2	1.0	1.9	1.6	6.9	1.8	0.8	0.4	0.1	0.5	0.5	0.1	**46,626**
North East	91.9	1.1	1.5	0.1	2.0	1.8	0.6	0.1	0.0	0.4	0.5	0.0	**20,911**
Ngamiland East	81.4	1.5	3.2	0.7	5.9	4.2	0.3	0.4	0.0	1.2	1.1	0.1	**31,582**
Ngamiland West	84.5	1.0	0.7	1.9	6.2	3.6	0.0	0.3	0.1	0.5	0.8	0.2	**17,921**
Chobe	89.5	0.4	0.8	0.1	7.4	0.2	0.0	0.3	0.1	0.8	0.4	0.0	**10,123**
Delta	0.0	0.0	0.5	1.0	50.3	46.1	0.0	2.1	0.0	0.0	0.0	0.0	**191**
Ghanzi	73.0	2.3	3.4	0.3	17.9	0.0	0.4	0.5	0.1	1.4	0.5	0.2	**15,143**
CKGR	0.0	76.2	8.3	0.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**84**
Kgalagadi South	81.9	3.2	2.9	0.3	9.5	0.0	0.2	0.3	0.0	0.3	1.1	0.1	**9,745**
Kgalagadi North	87.3	1.7	3.9	0.1	4.5	0.0	0.0	0.5	0.0	0.7	1.2	0.1	**7,171**
TOTAL	**84.7**	**1.9**	**2.5**	**0.5**	**6.7**	**0.8**	**0.5**	**0.3**	**0.0**	**0.9**	**1.0**	**0.1**	**697,161**

TABLE 8: Proportion of Households by Principal Water Supply Source for Other Uses by Locality

LOCALITY	PRINCIPAL WATER SUPPLY SOURCE												TOTAL
	WATER UTILITIES CORPORATION (WUC)	BOUSER	TANKER	WELL	BOREHOLE	RIVER/ STREAM	DAM/ PAN	RAINWATER TANK	SPRING WATER	BOTTLED WATER/ REFILL WATER	OTHER	DON'T KNOW	
Cities/Towns	95.7	0.5	0.3	0.0	0.2	0.0	0.0	0.0	0.0	1.4	1.8	0.0	**150,129**
Urban Village	94.2	1.5	2.2	0.0	0.4	0.1	0.1	0.1	0.0	1.0	0.5	0.1	**307,185**
Rural	65.8	3.3	4.4	1.5	18.8	2.3	1.4	0.7	0.1	0.6	1.0	0.1	**239,847**
TOTAL	84.7	1.9	2.5	0.5	6.7	0.8	0.5	0.3	0.0	0.9	1.0	0.1	**697,161**

TABLE 9: Proportion of Households with Toilets Available by Toilet type and District

CENSUS DISTRICT	TOILET AVAILABILITY BY TYPE							
	FLUSH TOILET (CONNECTED TO SEWER LINE)	FLUSH TOILET (WITH SEPTIC TANK)	VENTILATED IMPROVED PIT LATRINE (VIP)	PIT LATRINE	DRY COMPOST (E.G. ENVIRO LOO)	NONE	ACCESS TO IMPROVED SANITATION FACILITIES	TOTAL
Gaborone	88.5	4.5	0.8	5.8	0.0	0.3	99.6	**82,412**
Francistown	84.5	4.0	1.3	9.6	0.1	0.6	99.5	**33,809**
Lobatse	50.3	11.1	1.0	36.4	0.0	1.2	98.8	**9,839**
Selibe Phikwe	84.9	2.9	0.6	10.9	0.1	0.5	99.4	**13,329**
Orapa	99.7	0.3	0.0	0.0	0.0	0.0	100.0	**3,048**
Jwaneng	96.8	1.0	0.2	1.5	0.0	0.4	99.5	**6,586**
Sowa	100.0	0.0	0.0	0.0	0.0	0.0	100.0	**1,106**
Southern	8.5	16.6	4.1	56.1	1.6	13.1	86.9	**37,806**
Barolong	9.2	9.1	0.5	68.3	0.4	12.4	87.5	**16,498**
Ngwaketse West	7.5	9.7	5.2	40.2	1.6	35.8	64.2	**6,588**
South East	60.5	11.5	1.7	23.5	0.2	2.7	97.4	**36,326**
Kweneng East	31.3	18.3	2.7	41.3	0.8	5.7	94.4	**100,723**
Kweneng West	8.9	8.1	4.9	38.2	2.4	37.5	62.5	**15,920**
Kgatleng (Wards)	14.7	28.8	1.4	48.5	0.7	6.0	94.1	**36,537**
Central Serowe -Palapye	29.9	10.6	3.0	42.2	1.3	13.0	87.0	**56,987**
Central Mahalapye	22.0	7.8	3.9	50.2	1.6	14.4	85.5	**36,681**
Central Bobonong	16.2	17.1	0.8	47.5	1.7	16.8	83.3	**22,211**
Central Boteti	6.6	21.6	2.1	46.5	3.6	19.7	80.4	**21,258**
Central Tutume	17.9	11.3	2.4	52.0	1.6	14.8	85.2	**46,626**
North East	23.9	23.2	2.0	45.4	0.3	5.2	94.8	**20,911**
Ngamiland East	9.7	21.1	1.4	46.9	1.9	18.9	81.0	**31,582**
Ngamiland West	7.5	6.9	1.0	33.1	4.4	47.1	52.9	**17,921**
Chobe	48.1	12.9	2.0	29.6	0.8	6.6	93.4	**10,123**
Delta	0.0	1.0	0.5	25.1	18.3	55.0	44.9	**191**
Ghanzi	24.3	18.5	1.4	22.9	2.6	30.4	69.7	**15,143**
CKGR	1.2	10.7	0.0	0.0	0.0	88.1	11.9	**84**
Kgalagadi South	9.2	19.4	1.3	48.8	1.9	19.4	80.6	**9,745**
Kgalagadi North	6.9	22.5	4.5	47.4	0.9	17.8	82.2	**7,171**
NATIONAL	**36.1**	**13.2**	**2.1**	**36.5**	**1.1**	**11.0**	**89.0**	**697,161**

TABLE 10: Proportion of Households with Toilets Available by Toilet type and Locality

CENSUS DISTRICT	TOILET AVAILABILITY BY TYPE							
	FLUSH TOILET (CONNECTED TO SEWER LINE)	FLUSH TOILET (WITH SEPTIC TANK)	VENTILATED IMPROVED PIT LATRINE (VIP)	PIT LATRINE	DRY COMPOST (E.G. ENVIRO LOO)	NONE	ACCESS TO IMPROVED SANITATION FACILITIES	TOTAL
Cities/Towns	85.4	4.4	0.9	8.8	0.0	0.4	99.5	**150,129**
Urban Village	34.1	18.9	2.5	41.5	0.3	2.7	97.3	**307,185**
Rural	7.7	11.5	2.4	47.4	2.8	28.1	71.8	**239,847**
TOTAL	**36.1**	**13.2**	**2.1**	**36.5**	**1.1**	**11.0**	**89.0**	**697,161**

TABLE 11: Proportion of Households with Bathroom Available by Bathroom Type and District

CENSUS DISTRICT	BATHROOM AVAILABILITY BY TYPE					TOTAL
	BATHROOM WITH FIXED BATH OR SHOWER WITHIN HOUSING UNIT	BATHROOM WITHOUT FIXED BATH OR SHOWER WITHIN HOUSING UNIT	BATHROOM WITH FIXED BATH OR SHOWER OUTSIDE HOUSING UNIT	BATHROOM WITHOUT FIXED BATH OR SHOWER OUTSIDE HOUSING UNIT	NO BATHROOM AVAILABLE	
Gaborone	65.6	2.2	1.6	0.4	30.1	**82,412**
Francistown	56.8	3.3	1.9	0.6	37.3	**33,809**
Lobatse	49.3	2.9	0.7	0.3	46.8	**9,839**
Selibe Phikwe	61.9	5.4	3.4	0.7	28.6	**13,329**
Orapa	99.1	0.1	0.0	0.0	0.8	**3,048**
Jwaneng	86.9	1.4	0.7	0.1	10.9	**6,586**
Sowa	98.7	0.4	0.7	0.1	0.1	**1,106**
Southern	31.1	8.8	1.6	3.4	55.2	**37,806**
Barolong	24.1	12.0	0.7	2.6	60.5	**16,498**
Ngwaketse West	19.6	6.4	1.2	2.1	70.7	**6,588**
South East	55.9	4.4	2.3	1.1	36.2	**36,326**
Kweneng East	40.0	7.0	1.3	1.6	50.0	**100,723**
Kweneng West	17.2	6.0	1.1	2.4	73.4	**15,920**
Kgatleng (Wards)	43.7	7.5	1.4	1.7	45.6	**36,537**
Central Serowe -Palapye	38.0	6.8	1.3	1.9	52.0	**56,987**
Central Mahalapye	31.4	6.1	1.1	2.3	59.2	**36,681**
Central Bobonong	32.8	7.7	2.5	3.4	53.6	**22,211**
Central Boteti	25.3	7.0	0.9	1.5	65.3	**21,258**
Central Tutume	29.9	7.7	1.5	3.2	57.7	**46,626**
North East	45.1	6.2	1.6	2.3	44.7	**20,911**
Ngamiland East	30.3	13.3	1.6	3.2	51.6	**31,582**
Ngamiland West	14.8	7.7	1.4	6.9	69.3	**17,921**
Chobe	39.4	7.5	7.9	8.4	36.8	**10,123**
Delta	1.6	0.5	1.0	4.2	92.7	**191**
Ghanzi	31.6	6.5	4.0	1.9	56.0	**15,143**
CKGR	11.9	0.0	0.0	0.0	88.1	**84**
Kgalagadi South	28.9	7.3	0.6	2.1	61.1	**9,745**
Kgalagadi North	29.4	6.4	1.4	2.4	60.4	**7,171**
Total	**41.3**	**6.4**	**1.6**	**2.0**	**48.6**	**697,161**

TABLE 12: Proportion of Households with Bathroom Available by Bathroom Type and Locality

CENSUS DISTRICT	BATHROOM AVAILABILITY BY TYPE					TOTAL
	BATHROOM WITH FIXED BATH OR SHOWER WITHIN HOUSING UNIT	BATHROOM WITHOUT FIXED BATH OR SHOWER WITHIN HOUSING UNIT	BATHROOM WITH FIXED BATH OR SHOWER OUTSIDE HOUSING UNIT	BATHROOM WITHOUT FIXED BATH OR SHOWER OUTSIDE HOUSING UNIT	NO BATHROOM AVAILABLE	
Cities/Towns	64.1	2.7	1.7	0.4	31.1	**150,129**
Urban Village	46.7	7.5	1.7	1.7	42.5	**307,185**
Rural	20.0	7.5	1.5	3.5	67.5	**239,847**
TOTAL	**41.3**	**6.4**	**1.6**	**2.0**	**48.6**	**697,161**

FACTORS INFLUENCING HOUSEHOLD VEGETABLE CONSUMPTION IN BOTSWANA: AN ANALYSIS OF THE 2022 POPULATION AND HOUSING CENSUS

Anastacia Masesane and Tumelo Joseph

EXECUTIVE SUMMARY

A diet inclusive of vegetable and fruits does not only prevent the population from micronutrient deficiencies and non-communicable diseases (NCDs) but also contributes to an improved quality of life, productivity and economic stability. This manuscript delineates and analyses data relevant to vegetable consumption from the 2022 Botswana Population and Housing Census (PHC). The analysis involved correlating demographic and socio-economic information to determine the association with household's vegetable consumption.

The analysis utilised secondary data derived from 2022 PHC questionnaire that collected information on demographic and socio-economic characteristics of the respondents. These included religion, educational attainment, place of residence by district (urban and rural villages), mode of transport and access to Information and Communication Technology (ICT) by district. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 22.

The analysis explored the extent of vegetable consumption per household 7 days before the census commenced. The findings revealed that households within the urban areas and urban villages (89-82 percent) in Botswana mostly consumed vegetables compared to 66 percent of the households in the rural villages. The level of education attainment also positively contributed as the results showed that majority of households (90.7 percent) who consumed vegetables were degree holders while the lowest households 72.0 percent went up to primary school level. Access to internet connectivity varied across the country with urban and rural urban households showing an upper access and highest vegetable consumption while the lowest connectivity was shown at Kgalagadi South, Kweneng West, Ngwaketse West, Delta and CKGR being the least households in rural villages who consumed vegetable.

A conclusion that can be drawn from the analysis of the PHC data is that vegetables were consumed more in urban areas and urban villages compared to the rural villages. Vegetables might be more accessible, available and affordable at urban areas compared to rural area. Further, vegetable consumption was found to increase with education attainment. It is therefore important to prioritize promotion of vegetable consumption amongst the rural population to reduce risk factors associated with elevating NCDs. The report will inform mechanisms to improve vegetable consumption in disadvantaged rural villages and different population groups successively leading to the prevention of diet related diseases across all population.

This will contribute towards attainment of SDG 2 aimed at ending hunger, achieve food security and improved nutrition and promote sustainable agriculture and SDG 3 aimed at ensuring healthy lives and promote well-being for all at all ages by 2030. The target for SDG 3 include reducing mortality from non-communicable diseases and promoting mental health across the population. The results will also be used for decision making and policy development to improve national food and nutrition security situation for all, and for allocation of resources to rural districts where households below 60% consumed vegetables. This will contribute to the achievement of goals and priorities set in vision 2036 and agenda 2063.

1.0 INTRODUCTION

Vegetable consumption plays a vital role on improving public health nutrition for both children and adults. Globally, 3.9 million deaths worldwide in 2017 (70 percent of all deaths) were attributed to inadequate vegetable and fruit consumption. The World Health Organization (WHO, 2014) steps survey revealed that low vegetable and fruit consumption was among the top 4 risk factors globally(WHO, 2014). Consumption of a healthy diet throughout all stages of life does not only prevent malnutrition, but also diet-related non-communicable diseases such as diabetes, heart diseases, stroke, cancer and other health conditions (WHO, 2019).

A review of different studies on vegetable consumption and purchase behaviour of adults in Sub-Saharan Africa showed that considerable dietary shift is crucial in order to achieve Sustainable Development Goals (SDGs). Therefore, an increase in vegetable and fruit consumption need to be among the prioritized pillars of Nutrition and Food Security policies. The review further discovered that worldwide consumption of vegetable and fruit is way below the daily recommended allowance including in low and middle income countries (LMICs) particularly in Africa (Stadlmayr, 2023).

Botswana like other Sub-Saharan Africa countries is facing transition into the western diet which is evident through the rising of non-communicable diseases in the country. The WHO CD Profile, 2016 revealed that 41% of deaths in Botswana were attributed to NCDs. On their study aimed at examining multi-morbidity in Botswana, Ntiyani et al. revealed that poor fruit and vegetable consumption was among the contributing factors for multi-morbidity (Ntiyani et al., 2022). Therefore, an acceleration on interventions geared to prevent and manage NCDs need to be prioritized.

According to the 2022 PHC Preliminary report, Botswana has shown population increase of 15.9 percent from 2,0024.904 in 2011 to 2,359,609 in 2022 (2022 Statistics Botswana, 2022a). In order to feed the nation, the government remains committed to support Food Security programs including horticulture industry through Ministry of Agriculture (MOA) for the attainment of SDG 2 aimed at ending hunger and all forms of malnutrition by 2030. The Integrated Support Programme for Arable Agriculture Development (ISPAAD) included horticulture in 2013 as an expansion of Arable Agriculture program, supporting farmers with equipment and inputs. To further improve vegetable production in Botswana, the government introduced other programs such as Citizen Empowerment Development Agency (CEDA) funded programs in 2009, Agriculture Guarantee Scheme, and the Youth Development Fund (African Union, 2022). Currently MOA has programs such as Impact Accelerator Subsidy (ISA) aimed at improving horticulture production with 50% subsidy for both small and large-scale farmers.

Even though vegetable and fruit consumption has been generally low worldwide including in Botswana, a shift on the perception of vegetable consumption and changing of lifestyle behaviour was recognized following COVID 19 pandemic. The UNICEF report revealed that some of the impact of the pandemic was decreased consumption of unhealthy drinks and snacks and increased consumption of micronutrient rich vegetables (UNICEF, 2022).

One of Botswana's responsibilities as per Vision 2036 is for individuals to attain healthy lifestyles (Botswana Government, 2016). This is visible through the national response strategies to reduce NCDs which is primordial prevention and health promotion, through public awareness, promotion of healthy lifestyles and creation of enabling environments. The Botswana NCD Strategy 2016, indicated that the burden of NCDs in Botswana is rising and is associated with 46 percent of deaths in the country (NCD Strategy, 2018). Factors influencing consumer behaviour from social, physical and macro-environments need to be well understood at all levels in order to prevent NCD related diseases (Stadlmayr et al, 2023).

1.1 Problem Statement

The Botswana Steps survey conducted in 2014 revealed that a significant portion of 94.8 percent of Batswana consumed less than the recommended average of five servings of fruits and vegetables per day (WHO, 2014). Furthermore, the Botswana Demographic Survey (BDS) conducted in 2017 articulated that only 43.5 percent of the population consumed vegetables daily while 22.6 percent consumed it once in a while (Statistics Botswana, 2017). Factors associated to vegetable consumption in Botswana have not yet been extensively studied. It is therefore fundamental to conduct an analysis to understand better the factors influencing vegetable consumption in Botswana and close this knowledge gap. The findings on the analysis of 2022 PHC will inform policy makers and assist in the development of appropriate

1.2 Objective

The main objective of the study is to use data from the 2022 Population and Housing Census to determine factors influencing vegetable consumption in Botswana.

1.3 Definition of key/main concepts

Vegetable and fruit consumption, dietary intake, recommended intake, factors influencing vegetable consumption.

Vegetable and fruit consumption: Is the intake of vegetables and fruit as reported by the population in a specified period.

Dietary intake: Is the average daily intake of a nutrient or food

Recommended intake: The average daily dietary intake based on scientific knowledge sufficient to meet the nutrient requirement of nearly all.

2.0 LITERATURE REVIEW

2.1 State of research and knowledge

To help prevent micronutrient deficiencies, NCDs and associated risks, the World Health Organisation (WHO) and Food and Agricultural Organisation (FAO) recommend consumption of at least five portions (400g) of fruits and vegetables a day (WHO, 2019). The study conducted in seven countries including Bangladesh, Burkina Faso, Ethiopia, India, Nepal, Nigeria and Tanzania aimed at enhancing food systems related to vegetable and fruit consumption found that consumption of vegetables and fruits was low while LMICs was far below the recommended intake levels (Dijkxhoorn et al, 2021). The results further revealed consequent costs implications on public health and loss of economic activities in the agri-food sector.

2.2 Government Policy Framework

The Government of Botswana has a goal as per the 1997 National Population Policy (NPP) to ''Improve Quality of Life and Standard of Living of All People in Botswana''. The objectives and target of the revised NPP include improving the general health of the population through tackling extreme poverty, income inequality and unemployment among others (NDP11 Report, 2017). Furthermore, the NPP seeks to ensure gender equality and equity in the socio-cultural, political, economic and legal domains, all these targeted to be achieved by 2030. It is therefore imperial in regard to this policy to ensure that the government introduces programs aimed at improving food security including adequate supply of vegetables and fruits nationally, and community empowerment and resilience for the population to enjoy good health regardless of their socio-economic status and geographical area.

To ensure access to nutritious and sufficient food including vegetables at all times by all people of different economic status particularly the poor and vulnerable groups, NPP is delivered in line with addressing SDG 1, 2, and 3. These SDGs are aimed at ending poverty in all its forms, ending hunger, achieving food security and improving nutrition as well as promoting sustainable agriculture and ensuring healthy lives and well-being for all. The NPP and SDGs are in line with Vision 2036 similarly promoting human and social development as well as sustainable economic development (Statistics Botswana, 2018/19). Implementation and monitoring of the policy framework will lead to the achievement of agenda 2063 being self-sufficient including issues of food availability, accessibility and affordability interventions.

2.3 Factors Influencing Vegetable Consumption

Dietary shifts including increased consumption of vegetables and fruits is among the top priorities in achieving SDGs. It is therefore critical to understand factors influencing vegetable consumption for the population to meet the daily recommended intake. The factors that influence vegetable consumption can vary significantly as they are influenced by individual, social, physical and macro-level environments among others (Stadlmayr et al, 2023). The overall results for a cross-sectional study conducted in Botswana revealed that the prevalence of NCDs, common risk factors, malnutrition and dietary behaviours differ by gender. Furthermore, the findings showed a statistically significant results of low consumption of vegetable and/or fruit among men(Letamo, 2021). This shows that gender plays a role on the influence of vegetable consumption.

Socio-demographic and economic variables continue to show significant differences on the influence of vegetable consumption. This was revealed by the study conducted by French et al, on nutrition quality of food purchases which showed that lower income households purchased foods of lower nutritional quality compared to higher income households. Their results further showed that the purchase of vegetables was significantly positively associated with higher income (French et al, 2019).

3.0 METHODOLOGY

The analysis utilised secondary data derived from 2022 PHC questionnaire that collected information on demographic and socio-economic characteristics of respondents. The questionnaire was administered to the head of the household representing family members and the response was based on their socio-demographic characteristics. These included, religion, educational attainment, place of residence by district (urban and rural villages), district household size, mode of transport and access to Information and Communication Technology (ICT). All the characteristics were linked to the vegetable consumption in the 7 days prior to the administration of the questionnaire. The analysis implored descriptive statistics by frequencies, mean and averages to summarise demographic and socio-economic data. The bivariate analysis was used to determine factors associated with vegetable consumption. Statistical tests were performed using SPSS version 22.

4.0 FINDINGS AND DISCUSSIONS

This section entails findings of the analysis on factors influencing household vegetable consumption.

4.1 Household Vegetable Consumption by District

Table 1 illustrates household vegetable consumption by district in 7 days prior to administering the census questionnaire. More households that consumed vegetables were observed in Orapa, Francistown, Jwaneng and Gaborone at 95.1percent. 89.7 percent, 88.9 percent and 88.7 percent respectively. The lowest household vegetables consumption were found in Ngwaketse West (52.3 percent), Kweneng West (46.5 percent) Delta (33.9 percent) and CKGR recording the lowest households of 22.6 percent. These disparities between districts could translate that vegetables might be mostly available and accessible in towns than rural villages as shown on table 1. This was confirmed by the survey on "The state of food insecurity in Gaborone'' which found that vegetable consumption was among the highly consumed

food commodities due to the traditional way of consuming maize meal, relish and beef. The study further revealed that one of the reasons for high vegetable consumption in Gaborone were accessibility to the supermarkets with 92 percent of the households using them as their main source of food (Acquah et al, 2013).

4.2 District household size and vegetable Consumption

The average household size (hhs) remains relatively low at 3.3 percent, the same hhs was recorded by the Botswana Demographic survey conducted in 2017. The lowest households that consumed vegetables were noticed in rural districts with remarkably higher hhs between 4.0 percent and 14.4 percent. These districts included Ngami West, CKGR and Delta.

TABLE 1: Household Vegetable Consumption by District

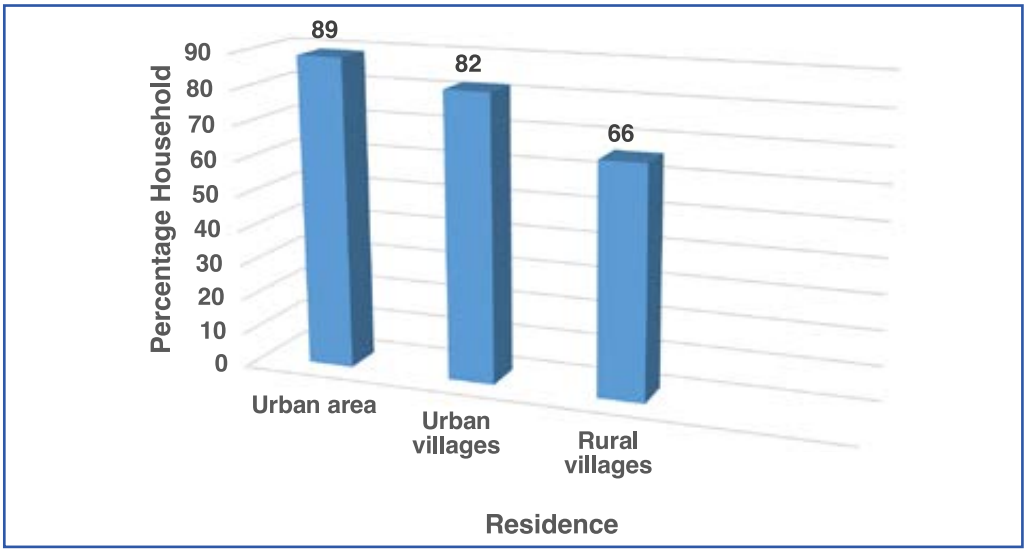
DISTRICT	HOUSEHOLDS	HOUSEHOLD SIZE	PERCENT VEGETABLE CONSUMPTION BY HOUSEHOLD
Gaborone	82,367	2.9	88.7
Francistown	33,792	3.0	89.7
Lobatse	9,834	2.9	84.4
Selibe Phikwe	13,323	3.0	86.0
Orapa	3,046	2.8	95.1
Jwaneng	6,578	2.8	88.9
Sowa	1,105	2.6	87.0
Southern	37,792	3.6	72.7
Barolong	16,497	3.5	73.8
Ngwaketse West	6,587	3.5	52.3
South East	36,309	3.0	86.7
Kweneng East	100,683	3.2	78.8
Kweneng West	15,910	3.5	46.5
Kgatleng (Wards)	36,524	3.3	80.5
Central Serowe -Palapye	56,960	3.5	77.4
Central Mahalapye	36,660	3.5	73.0
Central Bobonong	22,203	3.4	72.7
Central Boteti	21,236	3.4	72.1
Central Tutume	46,617	3.5	80.1
North East	20,901	3.3	87.8
Ngamiland East	31,564	3.2	69.9
Ngamiland West	17,911	4.0	68.7
Chobe	10,120	2.8	79.2
Delta	189	14.4	33.9
Ghanzi	15,112	3.5	62.8
CKGR	84	5.8	22.6
Kgalagadi South	9,734	3.5	58.5
Kgalagadi North	7,167	3.2	61.9
TOTAL	**696,805**	**3.3**	**72.6**

NB: Household size information was derived from 2022 Population and Housing census preliminary report

4.3 Household Vegetable Consumption by Urban and Rural areas

Figure 1 indicated that more households (89 percent) residing in urban areas consumed vegetables compared to households in urban villages (82 percent). It was noted that fewer households (66 percent) in the rural villages consumed vegetables in the 7 days before the administration of the census questionnaire. In general, an average of 72.6 percent households reported that they consumed vegetables. The disparity between rural villages and urban areas could translate that vegetables are mostly available and accessible in the urban areas and urban villages compared to the rural villages.

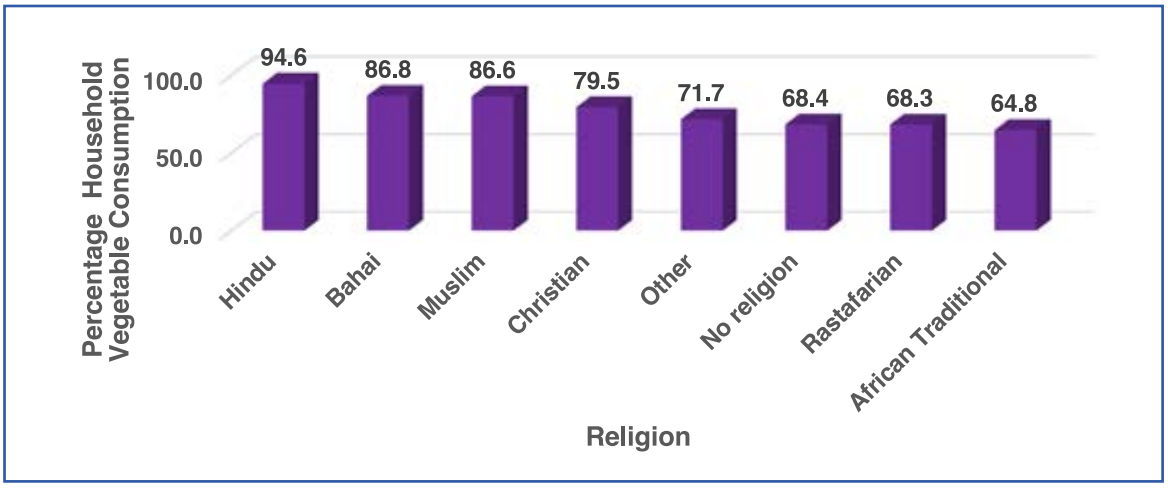
FIGURE 1: HOUSEHOLD VEGETABLE CONSUMPTION BY RESIDENCE 2022



4.4 Household Vegetable Consumption by Religion

Vegetable consumption by religion in **Figure 2** revealed that the Hindu households mostly consumed vegetables followed by Bahai and Muslim with 94.6 percent, 86.8 percent and 86.6 percent respectively. African traditional religion and Rastafarian had the lowest households (64.8 and 68.3 percent respectively) that consumed vegetables. It was discovered that majority of the Hindu religion population are vegetarians which explains the highest consumption of vegetables shown in the figure.

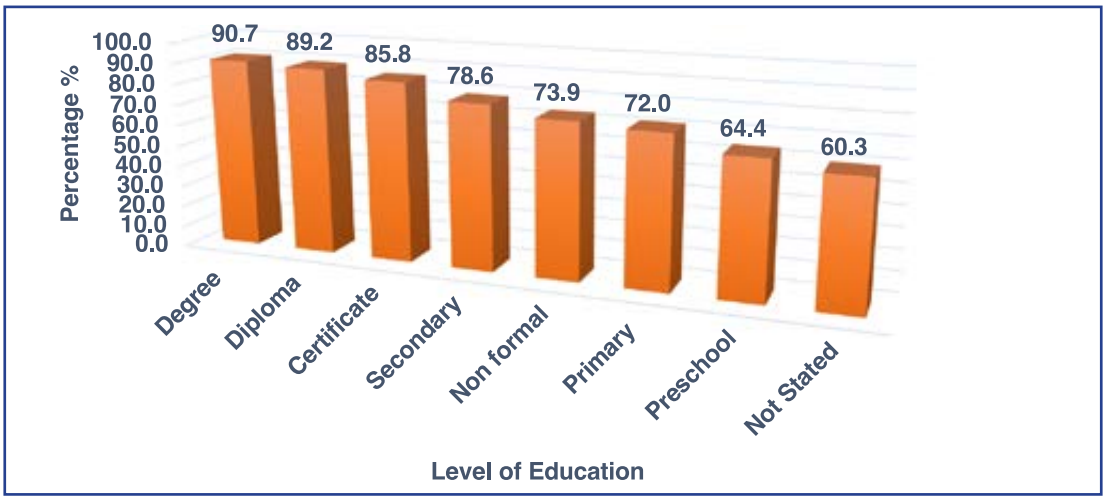
FIGURE 2: HOUSEHOLD VEGETABLE CONSUMPTION BY RELIGION 2022



4.5 Household vegetable Consumption by level of Education

The association between household vegetable consumption and education level revealed that more households 90.7 percent with head of households who attained degree consumed vegetables while lower households who consumed vegetables were those with the highest qualification of household head with primary school level (72.0 percent) education attainment as indicated in **Figure 3**. A similar trend was reported by Stadlmayr et. al, showing that frequency and quantity of vegetable and fruit consumption as well as purchase power in Sub-Saharan Africa increased with higher level of education (Stadlmayr et al, 2023). This could translate to the fact that highly educated people are more likely to be informed about the importance of vegetable consumption placing them in a better position of prioritising them in their food choices. The households with educated head of households are more likely to become positively influenced to include vegetables as part of their diet.

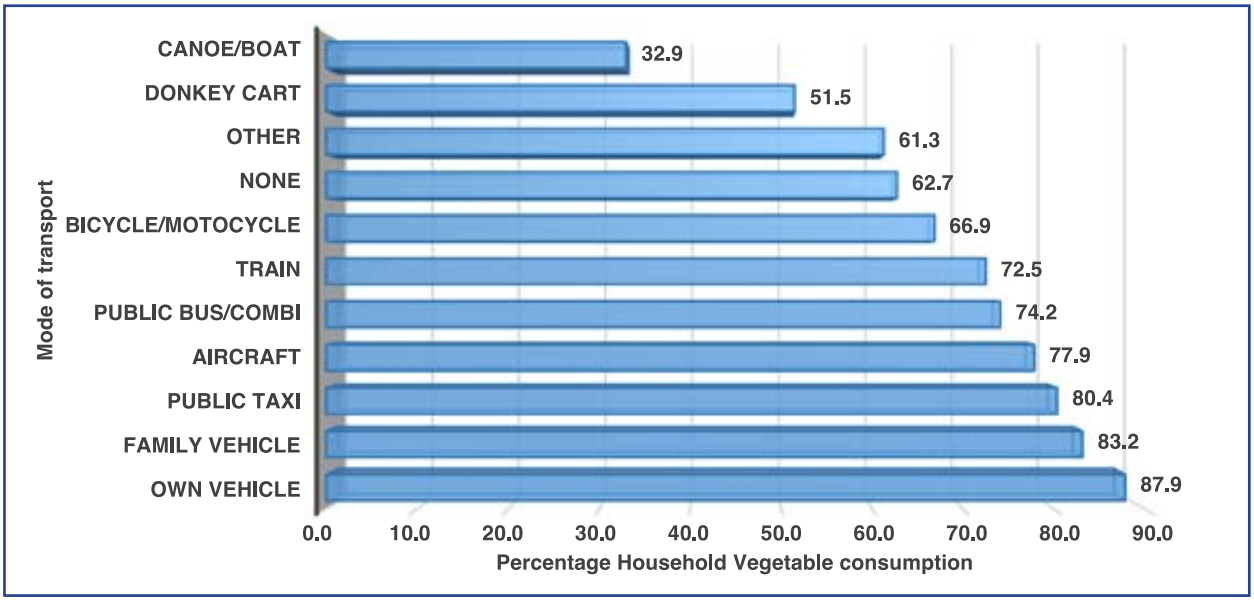
FIGURE 3: HOUSEHOLD VEGETABLE CONSUMPTION BY LEVEL OF EDUCATION 2022



4.6 Household Vegetable Consumption by Mode of Transport

Figure 4 illustrates that households with assets such as own vehicles mainly consumed vegetables (87.9 percent) followed by those using family cars and public taxis at 83.2 percent and 80.4 percent respectively. Low vegetable consumption was recognized at households using canoe or boat (32.9 percent) followed by those using donkey carts (51.5 percent). Ownership of transport is a sign of wealth with such households accessing vegetables more easily than others.

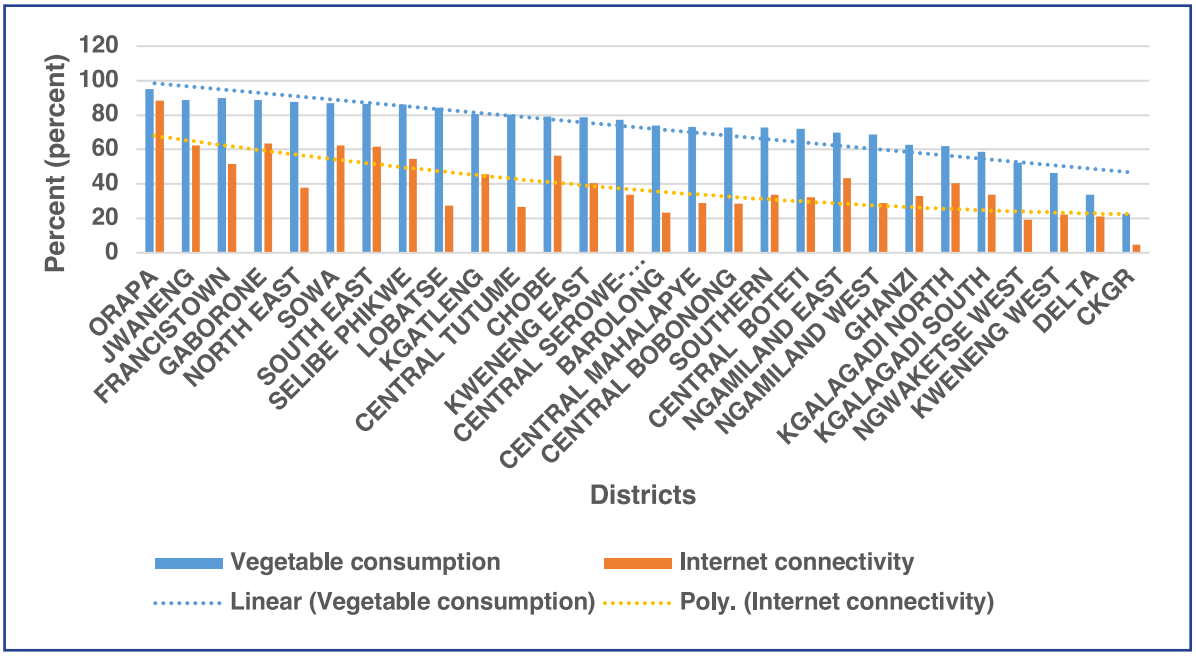
FIGURE 4: HOUSEHOLD VEGETABLE CONSUMPTION BY MODE OF TRANSPORT 2022



Household Consumption of Vegetables by District Versus Internet Connectivity

The analysis explored vegetable consumption by district versus internet connectivity as demonstrated in **Figure 5**. It was evident that internet connectivity was mostly common at cities and major villages where similarly vegetable consumption was higher among those households. Exposure to knowledge on the importance of vegetable consumption as part of health promotion through internet access might have contributed to higher consumption of vegetables at such districts. More households (95 percent) with highest internet connectivity (88.2 percent) in Orapa consumed vegetables as opposed to only (22.6 percent) households in CKGR where internet connectivity was low (4.8 percent). Similar findings were revealed by a household survey on access to information technologies and consumption of fruit and vegetables in South Africa. The study found that households with access to internet were significantly associated with increased vegetable consumption (Sinyolo et al, 2020).

FIGURE 5: HOUSEHOLD VEGETABLE CONSUMPTION BY DISTRICT VERSUS INTERNET CONNECTIVITY 2022



5.0 POLICY IMPLICATIONS

According to Food and Agricultural Organization (FAO) Food security is defined as ''a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life''. The government of Botswana has gone a long way in development of programs that address food and nutrition security to meet the nation's needs. Some of the policies and programs available include;

Development of National Food and Nutrition Policy: Even though the main responsibility of food security lies within the Ministry of Agriculture, a multi-sectoral approach in the development of this policy was established involving Ministry of Health (leading coordination) and other supporting partners such as FAO and SADC among others, contributing toward an inclusive policy for meeting the standards of sufficient, safe and nutritious food for all.

National Food Based Dietary Guidelines: The upcoming guidelines under development carries weight in terms of promoting healthy eating across different age groups, emphasizing the half of food plate to be covered with vegetables and fruits while reducing unhealthy eating through life changing health education and promotion messages.

Home Grown School Feeding Program: Aimed at improving livelihood of small farmers and local communities and sustainable production of diversified crops to close the gaps of minimum acceptable diet at primary school including vegetable and fruits. Even though the program addresses food security at primary schools, interventions need to be strengthened across the country as vegetable consumption is still lower among school going age groups.

Botswana Multi-Sectoral Strategy for the Prevention of NCDs: 2018-2023; The effects of nutrition transition characterized by highly refined foods and low intake of vegetable and fruits resulting in escalated NDCDs are evident. The 2022 population census showed that households with lower vegetable consumption were among the rural villages, less educated and lower access to internet connection. The results on household vegetable consumption by education level indicated that the strategy need to invest on efforts towards health and nutrition education with focus on promotion of vegetable consumption for the entire population at all levels. This clearly shows that we have to strengthen strategies aimed to achieve the set targets for the SDGs to attain equity.

Vegetable Import Ban: As an effort to improve food security and sustainability in the country, an import ban was introduced in January 2022. The main aim was to improve horticulture competiveness and improve local vegetable production. This will contribute positively towards improving the economy by reducing the country's fresh produce import bill. However, measures need to be taken to evaluate the impact on demand supply, quality of the vegetable produced and price variation to ensure that the poorer households are not disadvantaged and strike the balance for the benefit of the government, small scale farmers and the entire population regardless of their background and area of residence. The results of the 2022 PHC showed that rural villages were the worst affected with an average of 66 percent vegetable consumption and therefore interventions to improve this situation need to be up-scaled at all levels to close this gap.

6.0 LIMITATIONS AND STRENGTHS

Several strengths and limitations were acknowledged from the analysis. It is worth noting that the 2022 PHC data is representative of the entire population with diversity of households covered. However, the following limitations were encountered during data analysis and report writing;

Only one methodology of 7 days prior to the administration of the questionnaire was used which is prone to recall bias.

The question asked about consumption of vegetables in general without categorizing them into types such as green leafy, yellow/orange, tubers, root and indigenous types.

The frequency of vegetable consumption within a week and portion size was not taken into consideration. Some of the major factors influencing vegetable consumption such as income, occupation and agricultural activities were not readily available for the analysis.

Follow up questions such as price and environmental markets supporting the outcome were not included.

7.0 CONCLUSION AND RECOMMENDATIONS

The analysis of PHC shows that even though the country has made efforts to improve food and nutrition security, majority of households in urban areas and urban villages mainly consumed vegetables compared to rural villages. Some of the socio-economic factors that influenced vegetable consumption included education attainment, religion, internet connectivity and mode of transport. Households with members with high education attainment were more likely to influence the family's food choices through their knowledge and access to promotion of healthy eating through the internet. The same households conveniently accessed food markets through their own or family transport compared to other households.

It is recommended that;

- Strategies and policies aimed at improving food and nutrition security enhance vegetable availability, accessibility and affordability across the entire population.
- Resource allocation need to prioritize districts with the lowest household vegetable consumption below 60% covering Kgalagadi South, Ngwaketse West, Kweneng West, Delta areas and CKGR.
- Strategies need to be developed through a multi-sectoral approach engaging different sectors and non-governmental organisations geared at aggressive improvement of health education and changing lifestyles targeting all population particularly the less privileged.
- Implementation and periodic evaluation of the available policies and strategies on food and nutrition security need to be enforced to impart social and behavioural change communication among different communities and age groups.
- Improvement of infrastructure including free internet connectivity to most villages need to be expedited for community empowerment and improved knowledge and awareness on the importance of healthy eating as it was evident during the era of COVID 19.

Similar studies determining factors associated with vegetable consumption with in-depth interviews on vegetable consumption frequencies within a week, portion sizes, categorizing different vegetable groups consumed and incorporating fruits to meet the global recommendation of 5 a day will add value to informing decision makers on the extent of the interventions needed for the country to achieve vision 2036 and agenda 2063.

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HOUSEHOLD FOOD CONSUMPTION IN BOTSWANA: ANALYSIS BASED ON THE 2022 BOTSWANA POPULATION AND HOUSING CENSUS

By Tumelo Joseph and Anastacia Masesane

EXECUTIVE SUMMARY

Household food consumption was studied using data that was sourced from the 2022 Botswana Population and Housing Census (PHC) conducted by Statistics Botswana and Partners. The study utilized a questionnaire that was designed to quantitatively capture information about (i) the demographic and socio-economic background of the respondents (profession, educational level, ethnic group, area of residence and sex), (ii) food consumption of the households in frequency of 7 days. The food groups administered in the questionnaire were Animal Proteins (red meat, chicken, and fish), Plant proteins (beans,) Vegetables (not listed/disaggregated by type), Cereals/starches (maize meal, sorghum, millet, rice, samp, spaghetti, macaroni, and bread), Milk (sour or fresh). Education level was grouped into four categories: (a) preschool, (b) primary, (c) secondary, and (d) tertiary education. Place of residence was further categorised into three groups, namely, urban (Towns and cities) urban villages (population more than 5000 people) and rural areas (population less than 5000 people. Data was analysed using a Statistical Package for Social Sciences (SPSS) version 22.

The findings of this analysis indicate that although maize meal was the highest consumed food by most households nationally (82.8 percent), other foods which were popularly consumed were bread, vegetables, milk, red meat, rice, chicken and sorghum (81.1, 78.0, 75.8, 73.6, 72,9, 69.2 and 62.0 percent) respectively. Amongst proteins, households who resided in cities (Gaborone and Francistown) and areas surrounding Gaborone (South East, Kweneng East and Kgatleng) had high consumption of chicken. The diamond mining towns (Orapa 90.7 percent and Jwaneng 85.0 percent) had more households who consumed red meat followed by households in Ngamiland East, which recorded 84.3 percent. On the other hand, consumption of fish for most of the households was below 40.0 percent in all districts except in the areas around the Delta where the highest consumption of 70.0 percent of the households was recorded. The relationship between consumption and area of residence/location was also analysed comparing consumption patterns of urban dwellers, urban rural and rural residents respectively. It was discovered that many households residing in rural areas consumed more sorghum and maize meal compared to meats (red meat, chicken and fish). Increased consumption of Pastas, rice and bread was observed more in households within urban areas. Education level also showed to have an impact on eating patterns as households consisting of individuals with tertiary education, showed lower consumption of starch compared to other households where education attainment was below tertiary level.

Moreover, the findings continue to reveal that higher household food consumption was observed among households with married couples compared to households with never married individuals.

In conclusion it is evident that the country is undergoing nutrition transition with most of the consumed foods staffs being predominantly cereal (starch) based (Ramolefhe GT1), (Maruapula & Chapman-Novakofski, 2007) &(Acquah, 2013). However, the Ministry of Health is currently making efforts to develop policies, guidelines and strategies to curb the increasing levels of wasting, stunting and diet related Non

Communicable Diseases (NCDs). Moreover, data gaps remain a huge challenge, which cripples the Ministry's efforts to make informed and accurate interventions hence the reason to conduct this study using recent available collected nation-wide data. There is also a need for more sectoral collaborations and urgent implementation of nutrition sensitive interventions across all levels.

INTRODUCTION

The right to food is a universal human right recognized in 1948 by the Universal Declaration of Human Rights. All humans, irrespective of their race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status have the right to adequate food and the right to be free from hunger (FAO, 2010). In Botswana, the right to food has been domesticated in to the Sustainable Development Goals (SDGs) indicators; SDG goal number 2; End hunger, achieve food security and improved nutrition and promote sustainable agriculture and by also mapping it into vision 2036 Pillar 2 of Human and Social Development. However, despite all these efforts, food security in Botswana remains a challenge. Although Botswana is regarded as an upper middle-income country, food security at household and national levels is still a threat. This situation has been exacerbated by inadequate rainfall and prolonged droughts over the past years (Staff & Publications, 2013). The effects of climate change have led to drier conditions leading to adverse food shortages and nutritional deficiencies.

1.1 Problem Statement

Several studies have been conducted over the years to investigate factors that influence food intakes and consumption patterns on different population groups in Botswana (Kasimba, Motswagole, Covic, & Claasen, 2018; Motswagole et al., 2020) and (Kasimba S.; Maruapula & Chapman-Novakofski, 2007). However, none of these studies covered a holistic Botswana population therefore leaving out other parts of the population unrepresented. Moreover, a challenge of inadequate recent nutrition data in the country cannot be over emphasised.

1.2 Objectives of the analysis

The main objective of this study was to use data from the 2022 population and housing census to determine household's food consumption in Botswana.

1.3 Definitions of main concepts/key points

Food consumption patterns, food security, dietary intakes, food groups

1. Food consumption patterns refers to the habitual choices and preferences individuals or communities make in their diets over a certain period.
2. Food Security is when all people at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.
3. Dietary intake refers to the daily eating patterns of an individual, including specific foods and calories consumed and relative quantities.
4. A food group is a collection of foods that share similar nutritional properties or biological classifications

2. LITERATURE REVIEW

2.1State of research and knowledge

There is a dearth of data regarding food consumption patterns in Botswana. This analysis therefore sought to fill this research gap and assess the household food consumption in the general population in Botswana using available census data. Some of the available surveys done, are not only outdated but also used a small sample size (1406 adults) in only 9 out of the 15 administrative districts, that were used at a time leaving some pockets of the cultures within the country unrepresented. Other recent studies done also focused more on food security and featured a small proportion of food consumption(Acquah, 2013; Ismail, 2021; Kasimba et al., 2018; Nnyepi, Phegelo, Ramolefhe-Mutumwa, & Mmopelwa, 2023) while the other study focused only on cereal consumption(M M Kebakile, 2003).

2.2 Food security situation at household level

At a household level, the prevalence of severe food insecurity has been increasing in recent years, due to continuous dry spells across the country, which negatively contribute to poor food consumption. Terrible food insecurities, continue to have impact on the nutritional status of the population with over 30.0 percent of the people in the country who suffered chronic undernourishment(KJ., 2008). The livelihoods and food consumption of most people especially in the rural areas rotates around animal products and the crops produced suggesting that majority of the population living in rural areas relies mostly on subsistence agriculture for their livelihoods. The main foods available and accessible by the rural population therefore revolves around what is produced (UNDP, 2012).

Contrary to these findings, other studies carried out in Botswana found that increasing numbers of Batswana are becoming urbanized, leading to traditional diets being substituted by westernized diets which are high in energy-dense and nutrient- poor hence micro nutrient deficiencies among the population (Charlene, 2011; Kasimba et al., 2018; Nnyepi, Gwisai, Lekgoa, & Seru, 2015; Onen, 2017.) Some authors such as Bahta also supported this indicating that, due to increased urbanization, purchasing of food is now the chief source of foodstuffs in Botswana. The author further indicated that, this poses a big challenge to rural communities due to long distances to and from markets as well as high food prices. This tend to be a disadvantage to low income population, normally characterized by high rates of unemployment (Sirak Bahta1*, 2017).

2.3 Food consumption patterns of commonly consumed foods

When it comes to food consumption patterns in Botswana, the widely and regularly consumed main staples are maize, sorghum and wheat respectively (Sirak Bahta1*, 2017). Nonetheless, a study conducted by Kebakile and others in 2003 showed a slight twist from Bahta indicting that the most consumed cereal in both the urban and peri-urban areas was sorghum, followed by maize, wheat, rice and millet respectively. These authors further hypothesized that perhaps sorghum is mostly consumed because it is largely a traditional crop and is still highly regarded as such. Interestingly this study further indicated that consumption levels of sorghum was frequently increasing with age and education level (M M Kebakile, 2003). Bahta and colleagues continued to say that vegetable were also widely consumed among the interviewed households with about 78.0 percent of them consuming them fortnightly. Additionally, animal proteins such as fish was said to be the leading source of protein and accounted for 79.0 percent.

2.4 COVID 19 and Food Consumption patterns

In recent years, the surfacing of the Novel corona virus (COVID-19) has also influenced eating patterns. The virus presented severe impact on human health causing sudden lifestyle changes including confinement, which resulted in eating habit changes. The COVID-19 changed the way people lived around the world, especially in low and middle income nations in Africa, as they adopted particular eating habits (Galali, 2021). A study by (Ismail, 2021) showed that during this epidemic, about 48.8 percent of respondents did not regularly eat fruits or vegetables and about 31.9 percent regularly ate salty snacks such chips, crackers and nuts.

2.5 Past and Current Policy Frameworks

In an effort to reduce challenges of food insecurity, the Government of Botswana, through the Ministry of Agricultural reviewed the 1991 National Policy on Agriculture, from food self-sufficiency to food security with the focus on access to food at affordable prices irrespective of source (BIDPA, 2008). The country has aligned the SDGs to the National Vision and the National Development Plan. Food security remains an important objective in Botswana's National Development Plan (NDP 10) and to the United Nations (UN) sustainable development goals (SDGs). The National Development Plan (NDP 11) also aimed at targeting the reduction in number of people living under the poverty line by 50.0 percent by the year 2020 and an increase in daily dietary energy supply (DES) from 2150 to 2600 kcal per person by 2010, and further to 2700 by 2016 and beyond (Sirak Bahta1*, 2017). However, challenges in ensuring that all persons and households have access to food at all times still persist (Sirak Bahta1*, 2017).

3. METHODOLOGY

Data used in this study was sourced from the 2022 Botswana Population and Housing Census conducted by Statistics Botswana and Partners. The questionnaire used was designed to quantitatively capture information about; the demographic and socio-economic background of the respondents (age, profession, educational level, ethnic group, area of residence and sex),

Nutrition (food consumption assessment of the households in 7 days prior to the interview).

The food groups administered in the questionnaire was further classified as follows;

a) Animal Proteins (red meat, chicken, fish),
b) Plant proteins (beans,)
c) Vegetables (not listed/disaggregated by type),
d) Cereals/starches (maize meal, sorghum, millet, rice, samp, spaghetti, macaroni, bread),
e) Milk (sour or fresh).

Section A (demographic and socio-economic background) data was then cross-tabulated with Section E (Nutrition) for further analysis to determine the relationship between education level, marital status, area of residence, food consumption at district and national level. Education level was grouped into three categories: **(a)** primary, **(b)** secondary and **(c)** tertiary education. Place of residence was categorised into three groups, namely, urban (Towns and cities) urban villages (population more than 5000 people) and rural areas (population less than 5000 people)

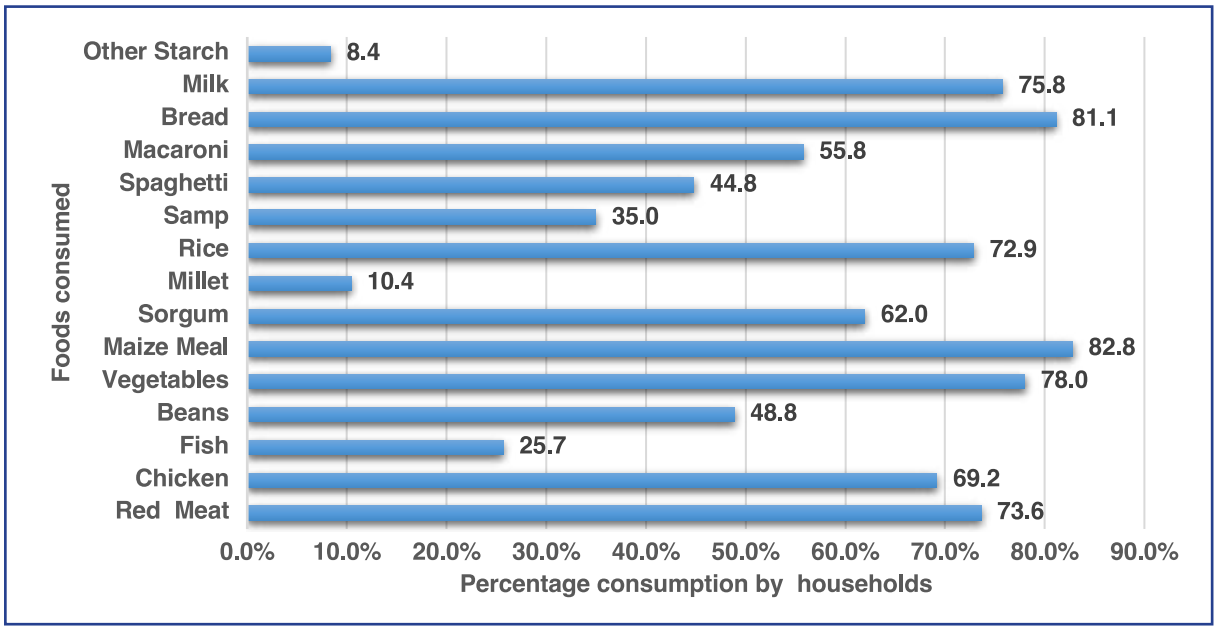
Data was analyzed using a Statistical Package for Social Sciences (SPSS) version 22.

4. FINDINGS AND DISCUSSION

4.1 National household Food Consumption

Figure 1 below shows that although maize meal was observed to be popularly eaten by most households nationally (82.8 percent), other foods that were also mostly consumed were bread, vegetables, milk, red meat, rice, chicken and sorghum (81.1, 78.0, 75.8, 73.6, 72,9, 69.2 and 62.0 percent) respectively.

FIGURE 1: NATIONAL HOUSEHOLD FOOD CONSUMPTION 2022



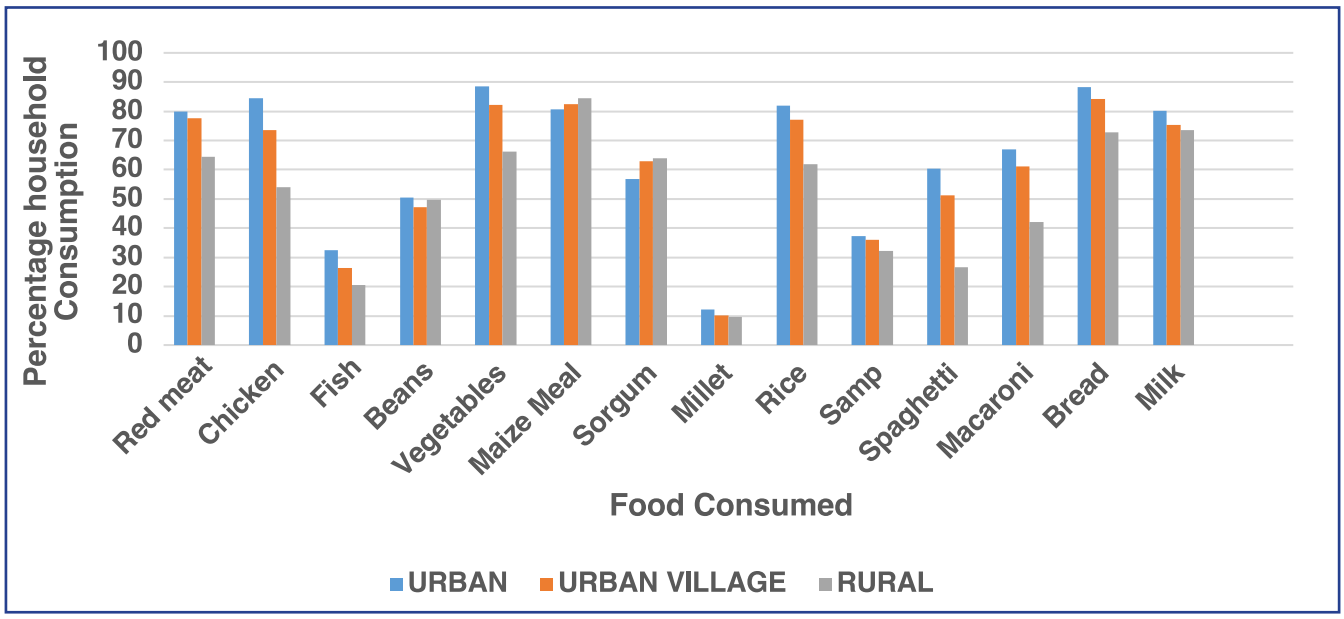
Anecdotal evidence suggests that in Botswana, the two most common foods eaten for breakfast are sorghum in the form of sorghum soft porridge (motogo) and bread cooked in different forms (fried, grilled or baked). However, more households seem to eat bread more (75,8 percent) compared to sorghum (62.0 percent) despite the fact that sorghum is a stable food for Batswana. These results are corroborating with results found by Kebakile e.t al who also found a decline in national sorghum consumption (M M Kebakile, 2003).

Despite the fact that 75.8 percent of household's consumed milk, it was assumed that it was mostly taken with tea/coffee. Generally, amongst proteins 73.6 percent of households consumed red meat, followed by 69.2 percent who ate chicken, while fish was the least consumed by only 10.4 percent households. Red meat especially beef consumption in Botswana is high because cattle are the predominant livestock (Maruapula SD, 2010) and beef is the most favourite dish cooked in various ways at different occasions including in weddings, funerals and in beef festivals in the country (Chatibura, 2023). **Figure 1** further indicates that a small percentage of households (30.0 percent) consumed millet and fish. This could be due to the fact that these foods are only predominant in some parts of the country (see Annex 1 figure 3 and 4 at district level). For example, fish was predominantly eaten in areas around the Delta and millet in the Northwestern and Northern eastern districts.

4.2 Household Food Consumption by Area of Residence

Overall, many households in rural areas consumed more sorghum and maize meal than vegetables and meats (red meat, chicken and fish). Increased consumption of Pastas, rice and bread was mostly observed in households within urban areas. This could be caused by urbanization and exposure to variety of foods, which is a contributing factor to nutrition transition (Charlene, 2011). The starch consumption of households was showing a close relationship between the common food combos sold in most retail stores where the composition of the most combos is mainly the refined starches.

FIGURE 2: HOUSEHOLD FOOD CONSUMPTION BY AREA OF RESIDENCE 2022



4.3 Household Protein Consumption by District

Households who reside in cities (Gaborone and Francistown) and areas surrounding Gaborone (South East, Kweneng East and Kgatleng) had high consumption of chicken as shown by **appendix 1, figure 3.** Diamond mining towns (Orapa 90.7 percent, Jwaneng 85.0 percent) had more households who consumed red meat followed by households in Ngamiland East, which recorded 84.3 percent. The economic empowerment activity of mining could be contributing to affordability hence increased consumption of the red meat in these areas. On the other hand, consumption of fish for most of the households was below 40.0 percent in all districts except in the areas around the Delta where the highest consumption of 70.0 percent of the households was recorded **(see Appendix 1- being figure3)**. Compared to other districts Okavango Delta is the largest source of water in Botswana, with the largest and most important fishery activity. This was evidenced by the 2004/ 2005 report, which showed that fish production constituted approximately 80 percent of the national fish catches (FAO, 2007).

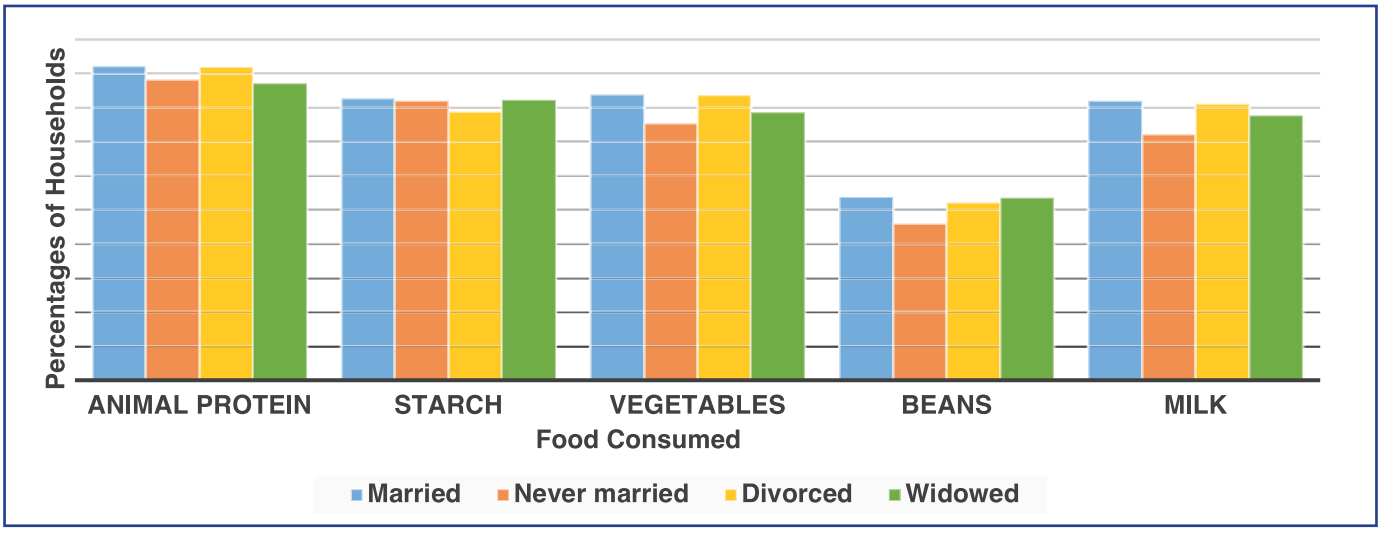
4.4 Household Starch Consumption by District

Generally, household's maize meal and bread consumption was high across all the districts. There were only four (4) districts with less than 80 percent households who consumed maize meal (Gaborone 78.0 percent, Sowa and Kgalagadi North at 77.5 percent each and lastly Kweneng West at 74.2 percent). The highest proportion of household (89.9 percent) who consumed maize meal were observed in Borolong. Sorghum was the least consumed amongst the four (4) main starches. Half of the households (50.0 percent) in the districts consumed all the starches while the highest was in Kweneng West with 75.3 percent and the lowest of 19.0 percent in CKGR. On the other hand, consumption of rice seemed to be mostly high (80.0 percent) amongst households in urban and rural urban areas **(see Appendix 2: Figure 4)**.

4.5 Influence of marital status on household food consumption

Further analysis in **Figure 5** below, shows that more households (80 percent) comprising of married couples were observed to have high consumption of most foods across all the food groups. Although households with married couples and those that were divorced scored almost the same consumption percentage on animal proteins, (92,2 and 92,0 percent respectively) beans were the least consumed type of protein across all family types within the interviewed households. On the other hand, the findings continue to reveal that households with individuals that were never married consumed less food when compared to other groups.

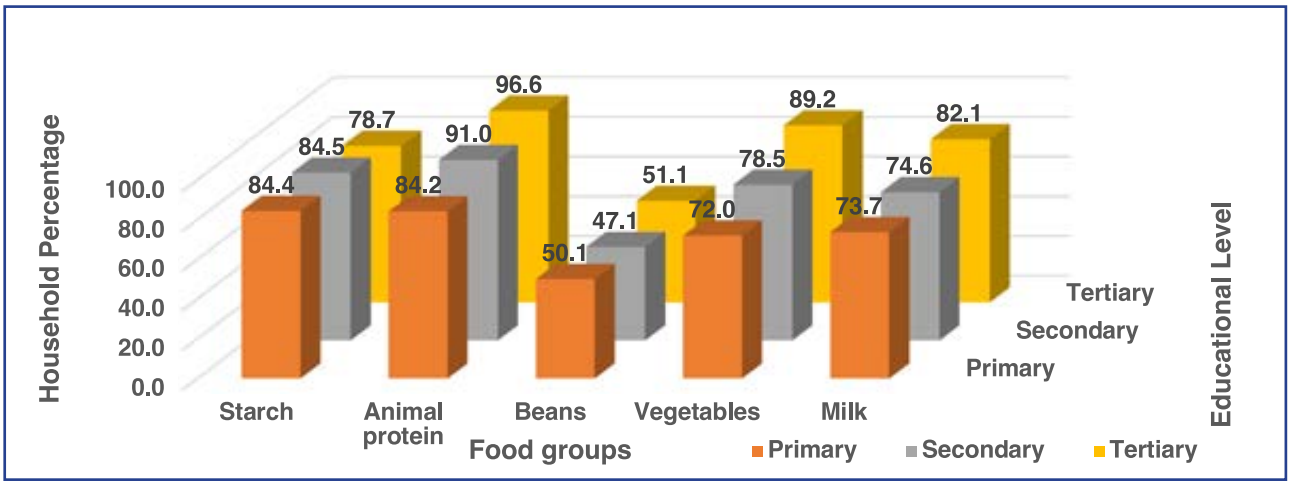
FIGURE 5: INFLUENCE OF MARITAL STATUS ON FOOD CONSUMPTION PATTERN BY HOUSEHOLDS 2022



4.6 Food consumption by educational level of households

Consumption of beans was low across all households despite the education levels. However, households consisting of individuals with tertiary education, showed lower consumption of starch compared to other households where education attainment was below tertiary as indicated in **Figure 6** below. This could be because beans are somehow culturally associated with being eaten by the poorer population, showing that more education on the importance of plant protein is needed across the population.

FIGURE 6: INFLUENCE OF EDUCATIONAL LEVEL BY HOUSEHOLDS 2022



Moreover, vegetables and milk consumption was low in households with individuals who attained primary education compared to secondary and tertiary. More households with individuals who attained tertiary level education, (96.6 percent) consumed more animal proteins and vegetables than other groups. These findings correlate with a study by (Moreira & Padrao, 2004) who also found that educational attainment was more frequently associated with food choices than income.

5. POLICY IMPLICATIONS

To address challenges of undiversified diets and inadequate nutrient intakes as presented in this analysis, Botswana is committed to the implementation of the SADC Food Security and Nutrition Strategy of 2015 – 2025, which was approved in 2014 by Member State governments to ensure that stunting levels (poor physical growth of children) are below 30.0 percent in all member states by 2025. This is in line with the Global Nutrition Targets of the World Health Assembly which are to be met by 2025, and the Sustainable Development Goals, all of which aim to improve maternal, infant and young child nutrition.

The country continually develops various policies, strategies and guidelines to curb malnutrition challenges. In 2020, Botswana commenced the development of the National Food-based Dietary Guidelines. The process is currently at the data analysis stage.

The Ministry of Health in partnership with Ministry of Agriculture are also in the process of developing a multi-sectoral National Food and Nutrition Policy, which main goal is to attain optimal nutritional status at all stages of life at all levels that is consistent with quality of life, productivity and longevity of life.

In addressing micro-nutrients deficiencies, the Government of Botswana has also found it fit to develop the National Food Fortification Strategy, integrating interventions from sectors of health, agriculture, trade, social protection, education, environment, water, sanitation and the private sector.

The country has also taken collaborative steps to repeal the Food Control Act (CAP 65:05) of 1993 and to enact the Food Safety and Quality Bill. The Act will include front of pack labeling which will in turn help in reducing overweight and obesity prevalence. Consumers will be able to make informed food choices for the betterment of their health.

Like many other countries, Botswana also has adopted the use of Health taxes in an effort to reduce consumption of foods that damage health. Food taxes such as alcohol tax levy and sugar-sweetened beverages (SSBs) are excise taxes that are implemented in Botswana. In 2008 the country introduced a 30 % Levy on alcoholic beverages followed by the introduction of Sugar-Sweetened Beverages Tax in 2021 at a rate of P0.02 per gram of sugar in excess of 4g per 100mL to curb the rise in non-communicable diseases in inclusion of obesity.

The Ministry of Agriculture in the past years has been focusing more on promoting production of cereal based crops (maize, sorghum, millet) than a combination of both cereals, fruits and vegetables. The country is recently making efforts to close those bottle necks by mainstreaming Nutrition into National Agriculture and Food Security Investment Plans (NAIPS), which ensures that agricultural and economic development policies and initiatives are nutrition-sensitive. Evaluation of programmes related to nutrition is also done in different forums, one of them being the Vulnerability Assessment and Analysis (VAA) committee which includes combined collection, analysis, interpretation, and reporting of nutrition and food security data.

Several programs currently in place in Botswana to combat malnutrition are Growth Monitoring and Promotion, supplementary feeding, the Integrated Management of Acute Malnutrition program, as well as protection and promotion of breastfeeding. Other nutrition interventions include routine iron-folate supplementation for pregnant women, marketing of foods for infants and young children Regulations SI 37 of 2005 which aims to protect, promote, and support breastfeeding through regulating the marketing of designated products intended for use by infants and young children.

6. LIMITATIONS

The following were the limitations observed during the analysis and write up of this manuscript.

The methodology used was limited to food consumption frequency over a period of 7 days and not clear on how often the food was take within those seven days. Ideally, the methodology should have also allowed for estimates of quantities of food items consumed in longer time period.

The data represent dietary responses of heads of household interviewed and not all members of the household making it difficult to deduce intake at individual level.

The food items in the questionnaire were also not determining the portion size making it difficult to conclude how much of the food was eaten.

Data had some missing food groups such as fruits, the vegetables were not disaggregated by types (green leafy, roots, cruciferous, marrow) and starchy foods especially bread, rice and pasta were not clear if they were refined or unrefined (white or brown).

The questionnaire had only one nutrition question with no follow up questions.

7. CONCLUSION AND RECOMMENDATIONS

In conclusion, maize meal, which is highly refined, was the highest consumed food by most households nationally while millet, sorghum, beans and fish consumption was relatively low in most households. This confirms the emergence of non-communicable diseases in the country. Moreover, our results further suggest that education level may influence food consumption pattern as households consisting of individuals with tertiary education, showed lower consumption of starch compared to other households where education attainment was below tertiary.

Given the above conclusion, it is of paramount importance to ensure:

A better structured nutrition/ dietary question for better acquisition of data. More supporting questions should be included to allow for the interrogation of nutritional intake at an individual level as opposed to household.

The use of a methodology that will be able to capture usual dietary intake (including portions) as opposed to the frequency of consumption of specific foods only.

Rapid completion and implementation of the ongoing work strategies, guidelines and policies. The 2022 PHC data findings came at an opportune time to overemphasize the need for finalization, Implementation, dissemination and monitoring of these policies, strategies and guidelines developed with a view to improve the health of individuals.

Coupled with existing studies conducted, the census results also presents a window for other studies and surveys geared at improving nutritional status of the country to be conducted which will help in closing the data gaps. It is a window to not only the Government but also all relevant researchers, institutions to team up and work on the challenge at hand.

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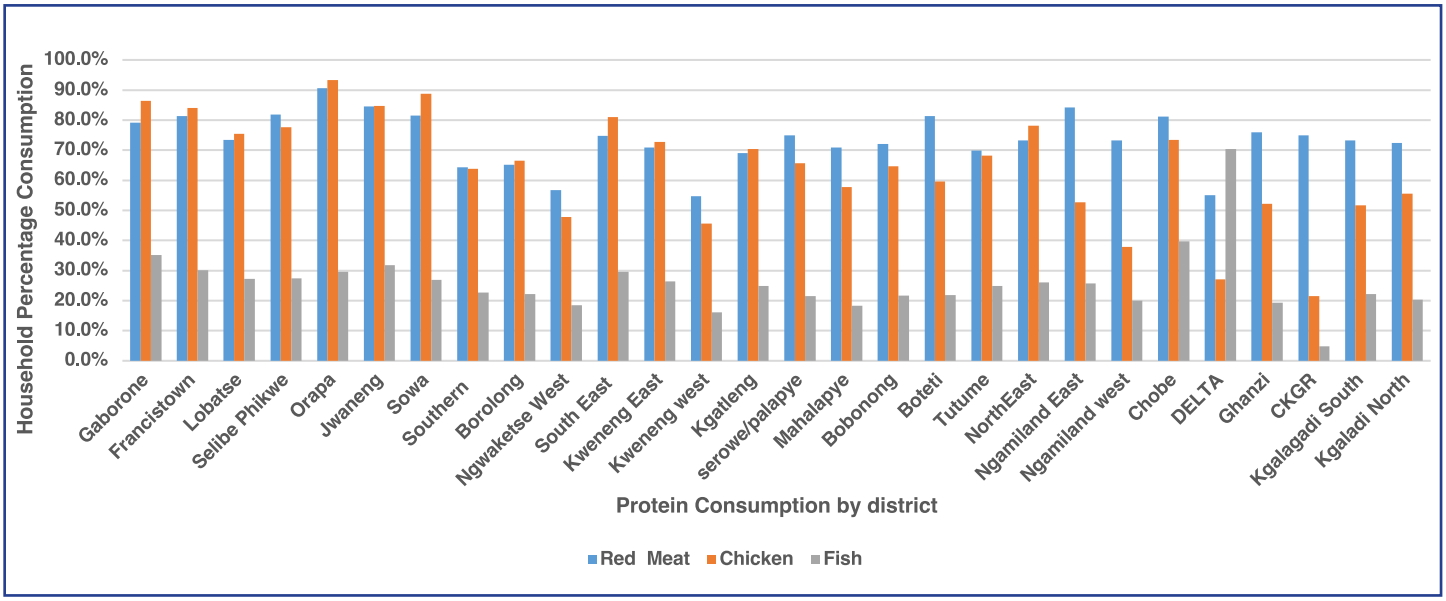
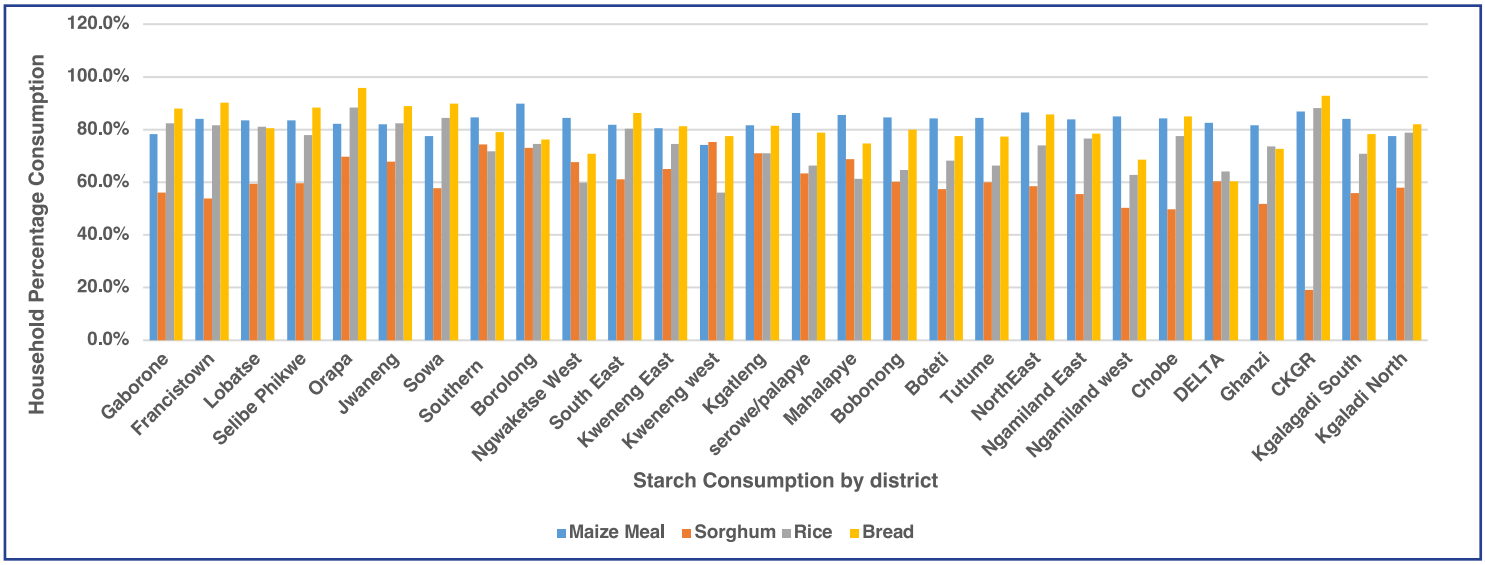
9. APPENDICES

APPENDIX 1 FIGURE 3: PROTEIN CONSUMPTION BY DISTRICT 2022



APPENDIX 2: FIGURE 4 STARCH CONSUMPTION BY DISTRICT 2022



HOUSING LINKAGES WITH WORK ACTIVITY IN BOTSWANA

Gertrude R. Mafatlane and Botshabelo Lucky Mafatlane

EXECUTIVE SUMMARY

INTRODUCTION

Housing is a human right and it is desirable that every household have access to adequate housing. Adequate housing is not shelter over the head but should provide privacy, dignity, warmth, protection from harsh weather and sufficient space for the users, with basic services and good sanitation. However, inadequate housing is a concern among low and middle income economies hence, many governments included the provision of adequate housing at the top of their agendas. Botswana as a middle income economy is no exception. Adequate housing is associated with positive health related outcomes (UN Habitat, nd). Poor health outcomes contribute to poor economic outcomes, that is, poor health is expensive as treatments come at a cost and deter one from engaging in a work activity (World Health Organization, 2018). However, the right to provision of adequate housing does not require governments to build the whole housing stock for the entire population rather have structures, frameworks, policies and strategies in place to facilitate provision of adequate house (UN Habitat, nd)

Objectives

- Examine Housing unit characteristics and correlate with work activity
- Analyze distribution of basic services by location and its association with work activity
- Analyze the distribution of sanitation availability by locality and its relationship to work activity

METHODOLOGY

A quantitative research approach using descriptive research design was used. A closed ended questionnaire was used for data collection during the 2022 Population and Housing Census (PHC). The population of Botswana was recorded as 2, 346,179 during the 2022 PHC (Statistics Botswana, 2023). Therefore, secondary data from 2022 PHC was used for analysis in the paper. Cross tabulations were done for type of housing unit, wall material, floor material, roof material, total number of rooms in the housing unit, acquisition of housing unit, main source of water, principal source of energy for cooking and availability of a toilet, mode of refuse disposal with work activity using SPSS version 25. The data was descriptively analyzed.

FINDINGS

The analysis on housing unit characteristics included trends in housing unit type, building materials, size and tenure then each was correlated with work activity. The results reveal that majority of households stayed in detached houses and an increase was observed with each year of the census. On the contrary, there was a notable decrease on traditional houses. Majority of these traditional type of housing units were found in rural areas. Rooms have been on a steady increase from 1991 to 2011 censuses, with a slight decline observed in 2022. However, a slight increase of shacks was observed in 2022 majority of which were found in rural areas.

Concerning raw materials for building houses, majority of households main house walls were built using conventional bricks irrespective of the work activity they were engaged in. However, the second commonly used main house wall material was mud bricks across all work activities except for members of producer cooperatives who used corrugated iron/zinc. With regards to floor material and work activity, majority of households used cement on their house floors irrespective of work activity they engage on except those who were self- employed (with employees) and members of producer cooperatives who used floor tiles. The second common floor material across most of the work activities was floor tiles. In terms of roofing materials and work activity, corrugated iron/zinc/tin was still used by most households irrespective of the work activity one engaged in, followed by use of roofing tiles. In general, the type wall, floor and roof material used in houses was not influenced by the type of work one does.

On the size of housing unit it was found that most households stayed in 1 room houses irrespective of work activity except for the self-employed (with employees) who stayed in 3 roomed houses. Those working in own agricultural activities commonly stayed in both 1 room and 2 roomed housing units. In terms of housing unit tenure, majority of male headed households were staying in rented housing units across all work activities except members of producer cooperatives and those working at their own agricultural activities. On the contrary, majority of female headed households stayed in self–built (owner-occupied) housing units across work activities except those employed paid in cash.

Variables of basic services that were analyzed include main source of drinking water infrastructure and principal source of energy for cooking which were each correlated with work activity. Majority of households across all work activities have piped water indoors in their housing units except employees paid in kind, those doing apprentice work and volunteer/ Tirelo Sechaba/Interns who mostly had outdoor water pipes. In terms of principal source of energy for cooking, majority of households used LPG (gas) as a principal source of energy for cooking across all work activities followed by electricity-national grid. It is worth noting that on the contrary, in rural areas the most common principal source of energy for cooking was firewood across all work activities except for those whose household heads were self -employed (with employees), followed by LPG.

Toilet availability and mode of refuse disposal were the two variables that were analyzed under sanitation and each was correlated with work activity. Generally most of households had toilets while minority (10.9%) did not have toilets. Majority of those without toilets were found in rural areas. Most of the toilets were flush toilets (connected to sewer line) followed by pit latrine then flush toilets (with septic tank). Generally, type of toilet was not influenced by the type of work activity the household head did rather, it was influenced by locality since availability of infrastructure is much influenced by locality. On the mode of refuse collection, regular collection was mostly used across different localities even though urban areas yielded highest proportions, followed by urban villages and lastly rural areas. The work activity the household head was engaged in did not affect the mode of refuse disposal used in households instead it depended on the locality.

CONCLUSIONS

1. Detached housing units are commonly used and increasing with each census. However, shacks have significantly decreased in urban areas but trends show that they are increasing in rural areas.
2. In general, households are committed to building good quality houses irrespective of the type of work they engaged in for the past seven days which gives assurance to achieving adequate housing through the spirit of self- reliance.
3. Durable building materials are mostly used for building houses in Botswana indicating progress towards attaining adequate housing.
4. Majority of the house units are small as housing unit size was 1 to 3 rooms with the dominance of 1 room.
5. Majority of male headed households stayed in rented housing units across all work activities while majority of female headed households stayed in self-built owner occupied.
6. Purchasing of housing units remained unchanged from previous PHC.
7. The most common source of energy for cooking in Botswana, both in urban and urban villages across all work activities is LPG (gas) followed by electricity from the national grid. However, in rural areas, the most common source of energy for cooking is wood followed by gas.
8. The most common toilet in urban areas is flush toilets (sewer line) followed by pit latrines while in urban villages and rural areas pit latrines are dominant followed by flush toilets with septic tanks.

However, there were those who do not have toilets across localities.

9. Regular collection of refuse from households has significantly increased and because it is obtained by registered entities it assures of appropriate disposal to dumping sites but burying and burning are also on the increase.

RECOMMENDATIONS

1. Building controls and standards must be implemented in rural areas to ensure that people satisfy certain standards when constructing or building their houses. This can curb the increase of shacks in rural areas.
2. Authorities responsible for housing matters must monitor closely to reduce increase in shacks.
3. Government already has a piloted programme to encourage use of biogas but its roll out to individuals is slow hence a few people use it. We recommend that the roll out must be stepped up.
4. There is a need for the Government to make a programme to encourage individual households on the use of solar power as a sources of energy for cooking. We note that the Government recently launched a project for the construction of a solar power plant in Mmadinare village, however, it is important for individual households to adopt solar power usage.
5. Building or provision of a toilet must be made mandatory for all establishment including at own agricultural establishments (lands/cattle post) for sanitation purposes. In addition all households in urban areas and urban villages must have flush toilets.
6. Sewerage systems services must be provided in all urban areas and urban villages to encourage households to migrate from pit latrine type of toilets to flush toilet to safeguard underground water.
7. The construction of pit latrines must have standards to prevent contamination of underground water.

INTRODUCTION

The right to adequate housing includes ensuring access to adequate services. The right to adequate housing does not just mean that the structure of the house itself must be adequate. There must also be sustainable and non-discriminatory access to facilities essential for health, security, comfort and nutrition. That is, there must be access to safe drinking water, energy for cooking, heating, lighting, sanitation and washing facilities, means of storing food, refuse disposal, site drainage and emergency services UN-Habitat, nd).

Housing is a human right and it is desirable that every household have access to adequate housing. Adequate housing is not shelter over the head but should provide privacy, dignity, warmth, protection from harsh weather and sufficient space for the users, with basic services and good sanitation. However, inadequate housing is a concern among low and middle income economies hence, many governments included the provision of adequate housing at the top of their agendas. Botswana as a middle income economy is no exception. Adequate housing is associated with positive health related outcomes (UN Habitat, nd). Poor health outcomes contribute to poor economic outcomes, that is, poor health is expensive as treatments come at a cost and deter one from engaging in a work activity (World Health Organization, 2018). However, the right to provision of adequate housing does not require governments to build the whole housing stock for the entire population rather have structures, frameworks, policies and strategies in place to facilitate provision of adequate house (UN Habitat, nd)

Botswana subscribes to the following frameworks and policies to implement the provision of adequate housing:

Globally, United Nations Sustainable Development Goals (UNSDGs) have 17 sustainable development goals which the Government of Botswana domesticated and are to be achieved by the year 2030. Amongst those is SDG 11 that advocates for cities and human settlements to be made inclusive, safe, resilient and sustainable. Target 11.1 of this goal requires Government of Botswana to provide adequate, safe and affordable housing and basic services to all its citizens and upgrade slums by year 2030 (Government of Botswana, 2017).

Regionally, Agenda 2063 has set some targets for continental growth with 7 aspirations, targets and performance indicators (PA). Of interest to this paper, is aspiration 1; a prosperous Africa, based on inclusive growth and sustainable development. Its goal is to provide people with high standard of living, quality of life and wellbeing for all citizens. One of the priority areas is to provide modern, affordable and livable habitats and quality basic services (African Union, 2015).

Nationally, Government of Botswana has some policies in place to address provision of housing in Botswana such as National Housing Policy in Botswana (NHP), Policy for destitute persons, and Policy for people with disabilities. The policies also advocate for provision of decent housing for all. In particular, the goal of National Housing Policy in Botswana of 2000 is to facilitate provision of decent and affordable housing for all within a safe and sanitary environment (Government of Botswana, 2000). In a nut shell, all frameworks and policies globally, regionally and nationally advocate for adequate housing for all.

This paper used variables from 2022 Housing and Population Census (HPC) data. In particular the paper is interested in the following variables relating to adequate housing; type of housing unit, wall material, floor material, roof material, total number of rooms in the housing unit, acquisition of housing unit, main source of drinking water , principal source of energy for cooking, availability of a toilet and mode of refuse disposal. The adequate housing variables were each correlated with work activity. According to 2022 HPC, work activity had 8 categories, namely; employed-paid in cash, employed paid in kind, self-employed (no employees), self-employed (with employees), member of producer cooperative, apprentice, Volunteer / Tirelo Sechaba / Intern, Unpaid family helper in family business and working at own agricultural activities (lands/cattle-posts).

It is important to establish whether work activity could or could not defeat the efforts of providing adequate housing in Botswana bearing in mind the unemployment rate. This paper will inform the Government of Botswana about the housing status and inform policy makers on the trends and changes in housing, challenges and new opportunities that could be brought about by housing and work activity.

Objectives

The objectives of the paper are to:

- Examine Housing unit characteristics and correlate with work activity
- Analyse distribution of basic services by locality and its association with work activity
- Analyse the distribution of sanitation availability by locality and its relationship to work activity

DEFINITION OF TERMS

Work activity – means type of work

Housing unit tenure - refers to the way the housing unit was acquired

Literature Review

Reviewed literature focused on housing characteristics such as type of housing unit, housing unit building materials (main house wall, floor and roof materials), housing unit size, housing unit tenure, basic services (main source of water for drinking and principal source of energy for cooking) and sanitation (toilet availability and mode of refuse disposal).

Housing Unit Characteristics

Housing unit characteristics to be reviewed by literature were type of housing unit, wall, floor and roof materials, total number of rooms in the housing unit and acquisition of housing unit. Basic services were access to water and electricity, and for sanitation was toilet availability and mode of refuse disposal.

Type of Housing Unit

Literature on type of housing shared trends in the proportions of types of housing units. For instance, Statistics Botswana (2014) found a steady increase of households staying in shacks in 1991 to 2001 Housing and population censuses. During the 2011 census the proportion of households living in shacks remained the same constituting 1.7%. The findings showed a decrease in households occupying traditional housing unit in 1991, 2001 and 2011 censuses. During the period the proportion of households occupying detached and semi-detached, flats, and rooms were on the increase. Although a transformation from the traditional to the modern way of living was evident, there was an increase in the proportion of households staying in shacks and a slight decrease in urban areas. Literature also had findings on type of housing unit by location. Singh and Dwivedi (2014) found that the decrease in the proportion of traditional housing units is also very much visible in rural and urban areas. In the rural areas, proportion of traditional housing units decreased in 1991 to 2011. In the urban areas, the proportion decreased from in 1991 to 2011. There was also an observation that rooms as a housing unit increased in 1991 to 2011 reflecting an increasing trend towards shared housing. The proportion of detached houses also increased significantly in the rural areas during the period under in 1991 to 2011. In 2011, mixed housing units were reduced from 2001. In urban areas, the most common type of housing unit was detached type, followed by rooms type of housing and least common was part on the commercial building. Traditional housing units were a small portion in 2011 in urban areas and rooms housing unit recorded a steady increase.

However, some literature addresses proportion of type of housing unit in terms of gender. Rakgoasi, (2014) revealed that the proportion of male and female headed households who reside in detached and semi-detached housing was almost similar indicating that female headed households are almost as likely as male headed households to reside in relatively good quality housing. It was also found that just over a fifth of male headed households and quarter of female headed households resided in traditional structures. The relatively over representation of female headed households residing in mud structures compared to male headed households might be an indicator of the relatively poorer state of female headed households, especially in rural areas when a large portion of houses are still constructed with mud. Some literature on type of unit was addressed on elderly people. For example, Moeng (2014) found that in 2011 census, most of the elderly people in urban areas live in detachable houses whereas detachable houses are found in rural areas. The most common type of housing for the elderly in rural areas were the traditional houses. Another type of housing unit common in urban areas was rooms house unit, seconded by urban villages.

Housing Unit Building Materials

Building materials should be carefully chosen to achieve adequate housing. Literature has shown that some building materials such as asbestos are health hazards therefore should not be used in housing construction. In Bangladesh, Bakchi et al (2024) found that poor housing construction materials were associated with an increased risk of developing acute respiratory infections (ARI) symptoms among under-five children. On one hand, Das et al, (2018) in Rwanda indicated that children residing in groups of enclosed dwellings, in households that cook indoors, and in households proximate to tree cover, are significantly more likely to experience symptoms of respiratory infection, illness with cough and difficulty breathing. On the other hand, children in households with cemented floors and ventilation holes in the cooking area, are significantly less likely to experience the same symptoms.

If appropriate building materials are used, they are to be correctly applied and maintained otherwise they would pose health threats. In Nigeria, Mbazor (2018) found that preferred roofing materials for house units was corrugated zinc and aluminum. However, the house units were mainly built with cement and plastered with cement but a few were built with mud and plastered with cement which cracked and became a health hazard as they were hiding places for mosquitos and rodents. In Pakistan, Quetta city, Mahar and Attia (2018) reported that majority of the house unit walls were built with baked bricks and cement mortar accounting for close to 60%. Floors were made of plain cement concrete constituting about 90% of the housing units followed by earth/sand/mud. About 80% of roofs were built with reinforced concrete slab followed by burnt brick tile. Natural building materials are preferred for their green, available and affordable nature but in Pakistan, Aftab et al. (2022) found that residing in homes with natural flooring and wall, significantly increase children under-five probability of experiencing ARI symptoms which were attributed to a dirt floor as is associated with poor health conditions among children under five whereas the cemented floor reduces respiratory infections.

Singh and Dwivedi (2014) found that the types of building materials used in rural areas in Botswana differ significantly and become more traditional with an increase with the distance from towns and cities. In 2011 census there were some buildings constructed with asbestos. From the 2011 population census it was also found that that in almost all house units had cement floor and a few used mud. Moreover, since 1991, there was a significant increase in the proportion of housing units having cemented floor while proportion of housing units having mud and dung floor has decreased almost in the same proportion. The proportions indicate the floors of most housing units are more durable, and there is a substantial increase in cement flooring from the traditional type of floor composed of mud and dung. As with the type of housing, there has been a general improvement in the quality of materials used especially for floor and roof overtime evident by durable floors and walls becoming common.

Housing Unit size

To achieve adequate housing a size of a house should be considered. Negative consequences of poor housing on health are reported in literature and overcrowding is one of them. In South Africa, Nkosi (2019) revealed that crowded dwellings were associated with elevated levels of acute respiratory and gastrointestinal symptoms, as well as fever/chills. Some literature reported that size of houses are associated with wellbeing of individuals but Foye (2017) found that moving to larger accommodation has no positive impact on subjective wellbeing.

Literature also has findings on number of households by type and size of housing, as well as the number of rooms. Statistics Botswana (2014) found that In Botswana 2011 census, households occupying one room were the highest followed by those residing in two rooms. Of all the households occupying one room, just above 50% lived in shacks. Households occupying mixed and traditional housing units followed respectively. Some degree of congestion was observed in such rooms exposing households to risk of contracting airborne diseases. Distribution of the number of households by size and number of rooms were further looked into, from the urban and rural perspective with the focus on households with five or more persons occupying one room as it showed some high level of overcrowding. In both urban and rural areas, households occupying one room decreased with the enlargement of household size. For households occupying one room in urban areas, just about a quarter of the total households had five or more persons occupying one room. About one tenth of households in rural areas had five or more persons occupying one room. Singh and Dwivedi (2014) found that about two-third of the housing units in 2011 census were small having 1-2 rooms at and small proportion of housing units were having five or more rooms. In general, the proportion of households decreases with an increase in the size of a housing and large number of housing units were of the one room type.

Housing Unit Tenure

Literature addressed issue of housing tenure by gender. In 2011 census in Botswana, Rakgoasi, (2014) found that the most common housing tenure was renting from council and inheritance, followed by self-built, purchased renting from government and renting from village development committees in that descending order. Over half of the houses were self-built or purchased while followed by rented. In terms of gender, the proportion of purchased or self-built houses was higher among female headed households compared to male headed households. The fact that a large proportion of female headed households reside in self-built or purchased houses might be indicative of the fact that women are relatively more empowered to work, earn and control their economic resources that ever before. Figure 4 shows the number of rooms occupied by households according to the sex of head of household. Literature has also addressed housing unit tenure in relation to elderly people. Moeng (2013) found that home owner occupied housing was more prevalent among the elderly persons constituting close to 95% of the elderly people residing in their own houses. Only as few as about 3% of the elderly people enumerated lived in rented houses. House rentals were more common in urban areas with about a quarter of the elderly persons in urban areas renting houses they live in and only 1% of the elderly in rural villages living in rented houses. The predominance of rented houses in towns can be explained by lack of affordable land to build in and the fact that most Batswana consider towns as temporary place of residence. No significant difference was observed between male and female elderly persons with respect to house ownership and tenure. Some literature analyses 2011 census in terms of districts. Singh and Dwivedi (2014) found that in four urban districts viz. Gaborone, Francistown, Lobatse and Selebi-Phikwe, over 50% of the households are living in the rental housing provided by individual house-owners. This suggests that housing has become a business opportunity to individuals.

Basic services

For the purposes of this paper, basic services that were analysed from 2022 Housing and population census data is main source of water infrastructure and principal source of energy for cooking.

Access to Drinking Water

Water is a basic necessity in life in many fronts and government have a mandate to enable it to reach households. However, it is one of the basic services needed to achieve adequate housing. In Akure Nigeria, Mbazor (2018) found that availability of housing and environmental services and facilities such as road network, electricity, water, toilet, kitchen and bathrooms were found to be in moderate supply. However, the distribution of these services and facilities differed according to residential zones and accommodation types. Some zones had better houses and facilities than others. Water supply was a challenge as some zones did not have public water supply and occupants were compelled to access water from other sources such as wells and boreholes but in dry season they bought water from water tankers or community boreholes or fetched water from neighbors who had dug boreholes. In Palistan, Quetta city Mahar and Attia (2018) indicated has water scarcity. Water connections are done but there is poor supply. Just above most households get water from tube or bore well of which some are privately owned and others are communal.

In 2011 census in Botswana, Rakgoasi, (2014) found that just less than three quarters of households had water piped into the house or within the yard. In fact, 30.2 and 39.9 percent of households had water piped indoors and outdoors, respectively; while a fifth (20.4%) accessed water from communal standpipes or neighbours' taps. The percentage of households which has water piped indoors are almost similar between male and female headed households (31.2% male and 29.1% female headed), while a slightly higher percentage of female headed households had water piped outdoors (within the yard) compared to males.

Moeng (2014) using 2011 census data for Botswana found that most of elderly persons get their water supply from piped outdoor taps. More elderly female persons than elderly male persons have access to indoor or outdoor taps in their homes. Most, 55% of the elderly persons use piped indoor tap water, while the main source of water in urban villages is piped outdoor tap water whereas in rural villages the majority of the elderly persons get their water from communal water taps. Only 7.2% of the elderly in rural villages have access to indoor tap water.

Access to Cooking Energy

Statistics Botswana (2014) findings of proportion of all households in urban and rural areas by principal energy source for cooking during the 1991, 2001 and 2011 wood/charcoal were mostly used during the three censuses, that is, both in urban and rural areas, followed by gas (LPG). The use of wood/charcoal in rural areas was over 77 percent during the review period; however overall use of wood for cooking was gradually declining. The use of electricity experienced a significant increase for both urban and rural areas. This is a good development because a significant increase in the use of electricity over other sources which emit a lot of carbon contributes to the reduction on the emission of greenhouse gases (GHGs). In terms of gender, Rakgoasi (2013) found that proportion of households that use wood for cooking is slightly higher among female headed households while the proportion that uses gas for cooking is marginally higher among male headed households than female headed households. A slightly higher proportion of male headed households use electricity for cooking compared to female headed households. Regarding elderly persons, Moeng (2014) found that in most of the households the elderly persons live in, fire wood was used for cooking, followed gas. A less percentage of elderly persons' households use electricity for cooking. The availability and use of electricity differs by location among elderly persons living as those in urban areas predominantly use electricity for cooking. Close to 90% of elderly persons in the rural villages use firewood for cooking.

Sanitation

Review of literature on sanitation focused on toilet availability and refuse disposal.

Toilet Availability

In Mbazor (2018) in Nigeria indicated that pit latrines toilets were commonly used. In one zone pit latrines accounted for 60% attributed to lack of water as it prohibits people from connecting piped water. Those with water in their homes fetch it from boreholes and take responsibility to hire sanitation trucks to empty the septic tanks.

Statistics Botswana (2014) found that there was an increase in access to improved sanitation facilities with only close to 10% without toilet facility in 2011 census. Flush toilets were common in urban areas during the review period as compared to the urban and rural districts combined for 2011 census. Number of households with access to flush toilets in urban areas increased between 2001 and 2011 censuses, whereas in urban and rural districts combined the proportion increased from 16.7 percent in 2001 to 26.8 percent in 2011. During the same period, pit latrine facilities were dominant in urban and rural districts combined as compared to cities and towns. The use of pit latrine facility was slightly on the increase in urban and rural districts in 2011. In urban and rural districts, Central district had the highest number of households with access to flush toilets both in 2001 and 2011, followed by Kweneng district. Generally, access to improved sanitation facilities by households in Botswana shows a positive trend which implies that households with access to unimproved sources of sanitation facilities are getting fewer. In terms of gender, Rakgoasi (2014) found that a slightly higher percentage of male headed households have a flush toilet compared to female headed households while a discernibly larger proportion of female headed households own a pit latrine compared to male headed households. The percentage of both male and female headed households who use a shared pit latrine is almost similar.

Mode of Refuse Disposal

Modukanele (2014) from 2011 HPC about 35% of the total households in Botswana received a regular refuse collection service which was an increase of 5.35% from 2001 census (29.29 %). Just above 55% of households receiving regular collection were in cities and towns while the rest are in urban and rural areas of the country. Those households receiving irregular refuse collection service accounted for 10.22%. This proportion was an increase compared to the 2001 census of 7.12%. Therefore, adding together the proportion of regular and irregular refuse collection total to 44.5% of households in Botswana receive some form of waste collection while 55.5% does not receive any refuse collection service at all. The use of rubbish pit significantly declined from 41.19% in 2001 to 24.09% in 2011. However, there has been an increase in burning as a mode of waste disposal from 7.33% in 2001 to 19.05% of households in 2011.

Literature that has been done on housing in Botswana has never been associated with work activity. Hence the importance of this paper.

Methodology

A closed ended questionnaire was used for data collection during the 2022 Population and Housing Census (PHC).The questionnaire was administered to respondents 12 years and above. Therefore, secondary data from 2022 Population and Housing Census was used for analysis in the paper. Cross tabulations were done for type of housing unit, wall material, floor material, roof material, total number of rooms in the housing unit, acquisition of housing unit, main source of water, principal source of energy for cooking and availability of a toilet, mode of refuse disposal with work activity using SPSS version 25. The data was descriptively analyzed.

Findings and Discussions

The paper presents the analyses for housing unit characteristics, housing unit building materials, basic services and sanitation as elements of adequate housing. Each of these variables were correlated with work activity, locality and sex where applicable.

Housing Unit Characteristics

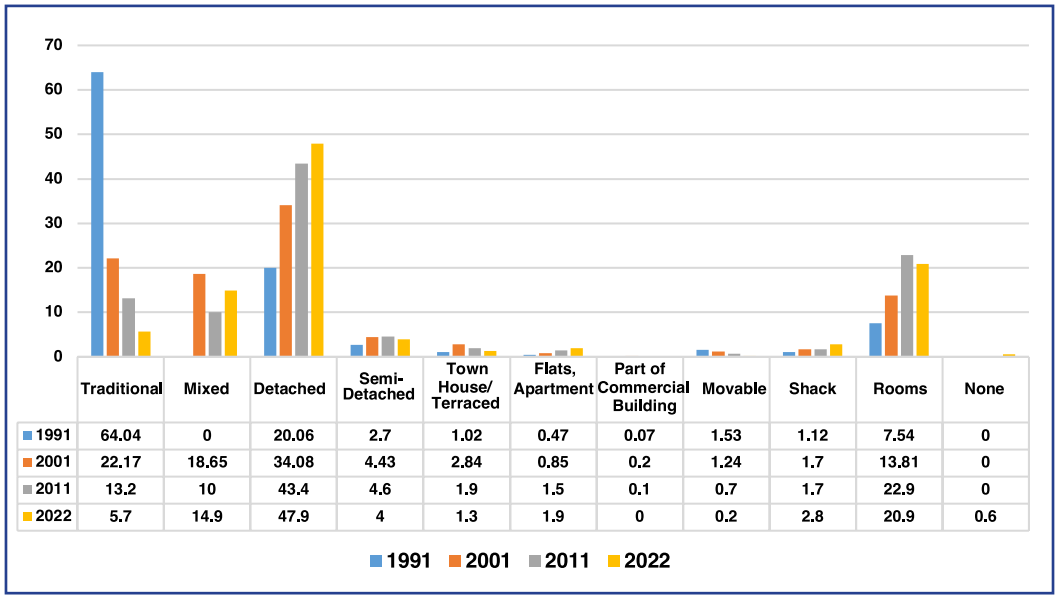
The analysis on housing unit included trends in housing unit type, building materials, size and tenure then each was correlated with work activity.

Type of Housing Unit

According to 2022 population and housing census, type of housing unit had seven categories. Namely, traditional, mixed, detached, semi-detached, townhouse/terraced, flat/apartment, part of commercial building, movable shack, rooms and none. Trends of type of housing units and its association with work activity were analysed.

Figure 1 presents the proportion of type of housing units in Botswana for Population and housing census for 1991, 2001, 2011 and 2022. The results reveal that majority of households stayed in detached houses and an increase was observed with each year of the census. On the contrary, there was a notable decrease on traditional houses which represented about 64% in 1991 and only 5.7 % in 2022. Majority of these traditional type of housing units (92.7%) was found in rural areas (Table 1). Rooms have been on a steady increase from 1991 (7.54%), 2001 (13.81%) and 2011(22.9), with a slight decline observed in 2022 (20.9%). However, after a steady proportion of shacks of 1.7% in 2001 and 2011, a slight increase (2.8%) was observed in 2022. Further analysis has shown that the majority of these shacks were found in rural areas **(Table 1)**. The increase SDG 11 requires the government of Botswana to ensure that by 2030, all the people have access to adequate housing.

FIGURE 1: Proportion of Type of Housing Unit 1991, 2001, 2011 and 2022



	Traditional	Mixed	Detached	Semi-Detached	Town House/ Terraced	Flats, Apartment	Part of Commercial Building	Movable	Shack	Rooms	None
1991	64.04	0	20.06	2.7	1.02	0.47	0.07	1.53	1.12	7.54	0
2001	22.17	18.65	34.08	4.43	2.84	0.85	0.2	1.24	1.7	13.81	0
2011	13.2	10	43.4	4.6	1.9	1.5	0.1	0.7	1.7	22.9	0
2022	5.7	14.9	47.9	4	1.3	1.9	0	0.2	2.8	20.9	0.6

Type of Housing Unit by Work Activity

Table 2 presents the results of the relationship between type of housing unit and work activity. Detached housing units were in majority across all work activities except those working at own agricultural activities (lands /cattlepost). Staying in rooms was the second highest for employees paid in cash, employee paid in kind, self- employed (no employees), self- employed (without employees) and apprentice. However, detached housing unit were followed by mixed housing unit for volunteers/tirelo sechaba/intern and unpaid family helper in business. Majority of those working in their own agricultural activities were staying in mixed housing units (33.3%) followed by detached units (29.6%) and the third being traditional housing units (21.2%).

Housing Unit Building materials

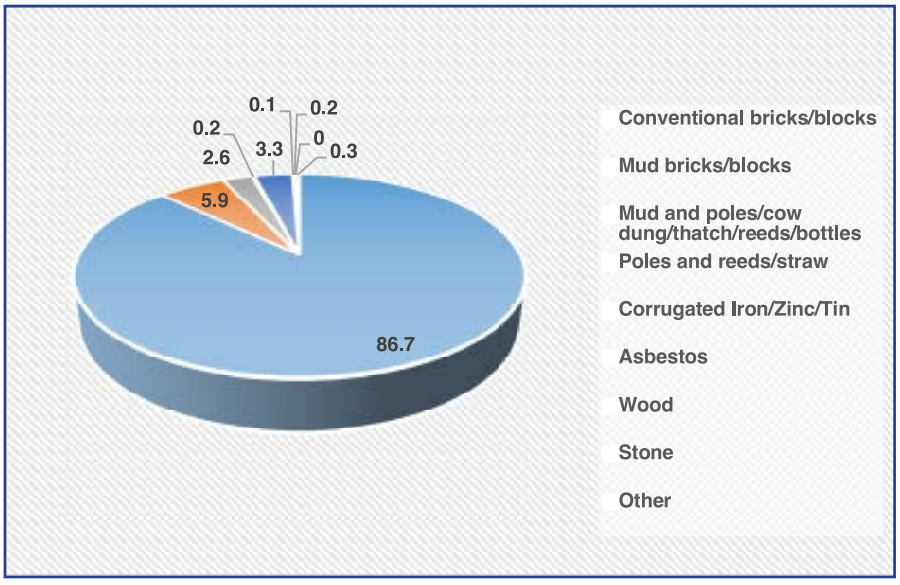
Building materials analysed from 2022 Population and Housing census were main house wall, roof and floor materials and each correlated with work activity.

Main house wall material

House walls were made from different materials. For 2022 Housing and Population Census, options for main house wall materials were conventional bricks, mud bricks, mud and pole/cow dung/thatch/reeds/bottles, poles and reeds/straw, corrugated iron/zinc/tin, asbestos, wood, stone and other that was not listed.

Figure 2 shows that majority (86.7%) of main house walls were built from convectional bricks with only 5.9% built with mud bricks. The use of remaining wall materials accounted for less than 5%. However, this does not take away the advantages of mud as a green, available and affordable material but a durability priority (Onyegiri, & Ugochukwu, 2016).

FIGURE 2: Proportion of main house wall material for 2022



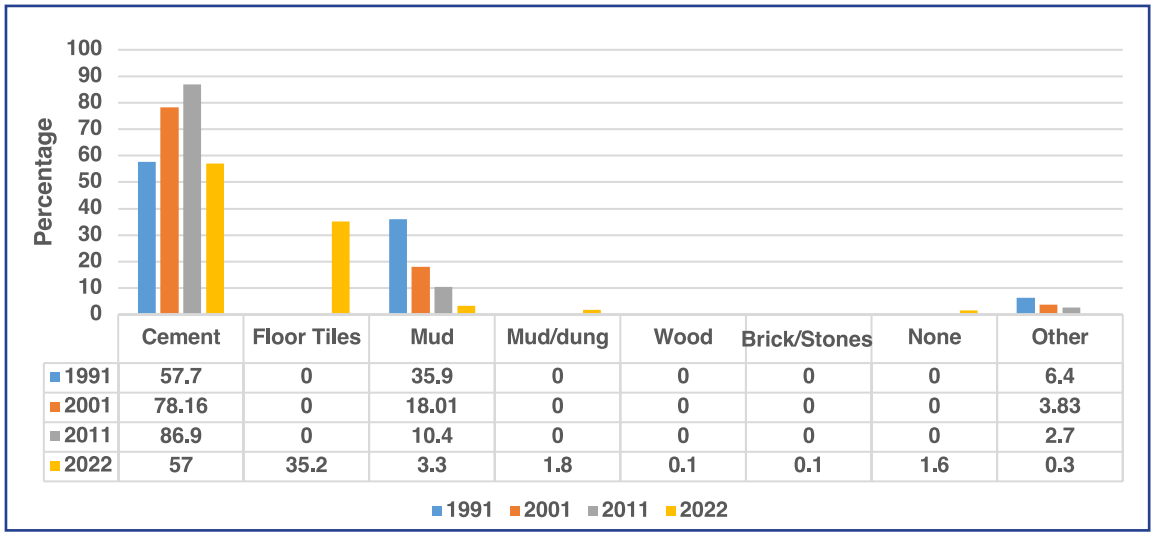
Main House Material and Work Activity

Regarding main house wall material and work activity, **Table 3** revealed that majority of households built their houses using conventional bricks irrespective of the work activity they were engaged in. However, the second commonly used main house wall material was mud bricks across all work activities except for members of producer cooperatives who used corrugated iron/zinc. As mentioned earlier mud has good properties such as good insulation therefore making mud houses cooler, but its main disadvantage is that it is not durable and requires regular maintenance hence, conventional bricks are becoming the mostly used material compared to mud.

Floor Material

The 2022 Population and Housing Census data had 7 categories for floor materials: cement, floor tiles, mud, mud/cow dung, wood, brick/stones and none. These were also analyzed with economic activity. Choice of floor materials is determined by different factors such as durability, availability, affordability and aesthetic appearance. Botswana has experienced increase in the number of different floor materials used in houses as evident in 2022 Housing and Population Census data. According to **Figure 3**, cement floor has been the prominent floor material in Botswana from PHC in 1991at 57.7% and increased to 86.9% in 2011. However, a decrease in the use of cement in the floor was reported in 2022 accounting for 57.0% almost the same as in 1991. This was the time when floor tiles were gaining popularity and relegated mud floor further to 3.3%. The 2022 PHC recorded some floor material types like mud/dung, wood and brick/ stone which were not recorded in earlier census literature.

FIGURE 3: Trends of proportion of floor materials for 1991, 2001, 2011 and 2022



	Cement	Floor Tiles	Mud	Mud/dung	Wood	Brick/Stones	None	Other
1991	57.7	0	35.9	0	0	0	0	6.4
2001	78.16	0	18.01	0	0	0	0	3.83
2011	86.9	0	10.4	0	0	0	0	2.7
2022	57	35.2	3.3	1.8	0.1	0.1	1.6	0.3

Floor material and work activity

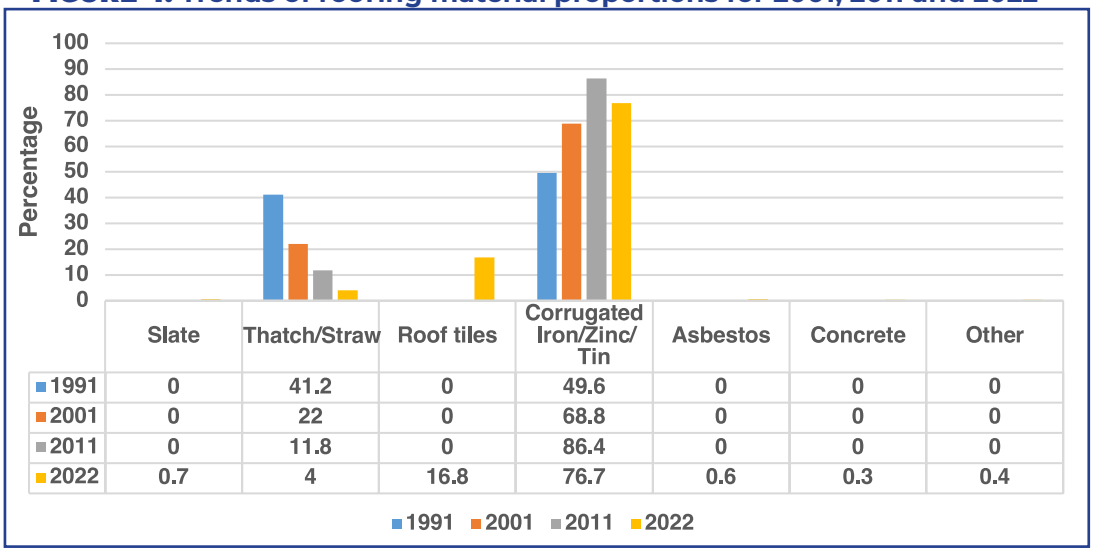
With regards to floor material and work activity, **Table 4** reveals that majority of households used cement on their house floors irrespective of work activity they engage on except those who were self- employed (with employees) and those who were member of producer cooperatives who prefer floor tiles. The second common floor material across most of the work activities was floor tiles. Although there is a strong competition between use of cement with 49.5 % and floor tiles with 45.6% for those who were employed paid in cash. However, majority of those who were members of producer cooperatives had used floor tiles (51.7%) followed by cement floor (45.5%). This trend is also observed for self-employed (no employees) which recorded 69.3% for floor tiles and 29.3% for cement floor.

Roofing Material

Choice of roofing materials is determined by affordability, durability, availability, prestige and aesthetic appearance. In Botswana, roofing materials have changed over the years moving with times from 1991 PHC to 2022. According to **Figure 4**, there has been a decrease in the use of thatch /straw for roofing houses from 41.2% in 1991 to only 4% in 2022. However, Botswana had an increase in the use of corrugated Iron/zinc/Tin from 1991 (49.6%) to 2011(86.4%) but a decrease (76.7%) was experienced in 2022 although it remained the mostly used roofing material. This could be attributed to the different roofing material options available in Botswana currently. For instance, corrugated iron was followed by a new entrant, roof tiles, displacing thatch/straw from the position 2. Although thatch/straw is relegated its insulation properties, affordability and availability factors are still valid but people turn to prefer durable materials and cost effective materials such as corrugated iron and roof tiles which require less maintenance (Steger, 2023). Additionally, untreated thatch can negatively affect ones respiratory health. Therefore, its reduction is a positive direction especially that in Botswana it is used untreated.

Generally, majority of Batswana use quality building materials on the walls, floor and roof. The concern is lack of implementation of housing standards in rural villages and rural areas to ensure proper building of houses through housing inspections that are done in urban areas.

FIGURE 4: Trends of roofing material proportions for 2001, 2011 and 2022



	Slate	Thatch/Straw	Roof tiles	Corrugated Iron/Zinc/ Tin	Asbestos	Concrete	Other
1991	0	41.2	0	49.6	0	0	0
2001	0	22	0	68.8	0	0	0
2011	0	11.8	0	86.4	0	0	0
2022	0.7	4	16.8	76.7	0.6	0.3	0.4

Roofing material and work activity

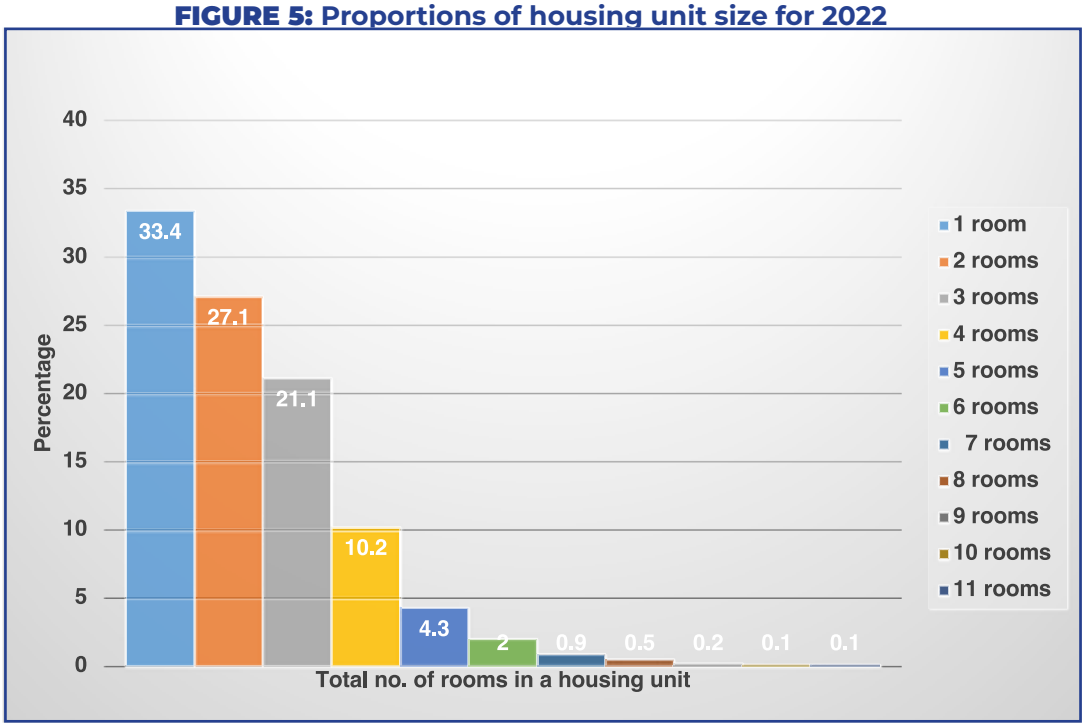
In terms of roofing materials and work activity, Table 5 reveals that corrugated iron/zinc/tin was still used my most households as a roofing material irrespective of the job activity one engages in, followed by use of roofing tiles. Although corrugated iron /zinc/tin use was in the lead with 51.6%, a closer contention was observed with roof tiles at 43.6% for self-employed (with employees). This shows that roof tiles, although it's a new entrant, is a strong contender for popularity. Singh and Dwivedi (2013) concluded that corrugated iron, tiles, slate and treated thatch are considered to be quality roofing materials. Therefore, most of the housing units are built with quality and durable roofing material. However, there is a concern that although asbestos has been identified as one of the materials that are a health hazard because it is associated with causing some respiratory diseases, in the 2022 PHC it was still being used on roofs and recorded 0.6% of the households.

In general, the type wall, floor and roof material used in houses is not influenced by the type of work one does.

Housing Unit Size

Total number of rooms is a measure for housing unit size. Figure 5 presents results of proportion of total number of rooms in a housing unit. The results indicate that the number of households decreases when the number of total number of rooms in the housing unit increases. Majority of households stayed in one roomed houses accounting for 33.4%, followed by 2 rooms with 27.1%, then 3 rooms with 21.1%. These three categories of housing units account for 81.6% of the total housing units types. Therefore, most households stayed in smaller housing units (one to three roomed housing units). This is the same scenario found in 2011 PHC. Signh and Dwivedi (2014) found that the proportion of households decrease with an increase in the size of a housing and one room accounted for 37.07% and two rooms accounted for 25.43%. However, there is a decrease (3.67%) in proportion of one room housing units, a slight increase (1.67%) of two roomed housing unit and a slight increase (1%) of households staying in housing units with 5 or more rooms for 2022 PHC.

FIGURE 5: Proportions of housing unit size for 2022



Housing Unit Size and Work Activity

Table 6 reveals that most households stayed in 1 room houses irrespective of work activity one engages in except those who were self-employed (with employees) who stayed in 3 roomed houses. Those working in own agricultural activities commonly stayed in both 1 room (28.9%) and 2 roomed houses (28.9%).

Housing Unit Tenure

Table 7(a) shows that most of households stayed in self-built houses accounting for 36.6% followed by renting from individuals with 28.4%. Although self-built (owner occupied) was still the highest percentage, there was a decline in 2022 PHC as Singh and Dwivedi (2014) had reported about 53% of the households for 2011 PHC. Renting from individuals was the second with a slight increase from 25.30% in 2011 to 28.4% in 2022. Staying in a family home became the third accounting for 16.1% and it was not part of the previous censuses. The decline in household self-built occupancy and a reasonable percentage of households staying in a family home may mean that some households rented their self-built houses and moved back to their family homes hence the increase in individual renting.

Botswana Housing Corporation (BHC) and Council has recorded a decline in proportion of households. BHC was 1.12% in 2011 and 0.8% in 2022 while Council was 1.38% in 2011 to 0.9% in 2022 although these institutions are mandated to provide housing. This may be attributed to high rental prices in these institutions.

Purchasing of housing units has remained almost relatively the same with 1.54% in 2011 and 1.5% in 2022. This may be attributed to affordability and high unemployment rate affecting the household's purchasing power. Government and private sector had donated housing units to some household constituting 0.8% and 0.2% respectively.

Comparing males and females, majority of female headed households stayed in self-built (owner occupied) housing units constituting 41.3 % compared to male headed households with 32.8%. A trend that was recorded by Singh and Dwivedi (2014) as female headed households recorded 57.03% and male headed households recorded 50.29%. However, there was a decline in proportion of households that self-built (owner occupied) generally for both sexes. In terms of renting from individuals and purchased (owner occupied), male headed households are higher in proportion than female headed households.

TABLE 7(a): Proportions of housing unit tenure for 2022

HOUSING UNIT TENURE	MALE	FEMALE	TOTAL
Self-built (Owner-occupied)	32.8	41.3	36.6
Family home	15.0	17.5	16.1
Rent Individual	31.5	24.6	28.4
Free(job related)	8.1	4.1	6.3
Rent Government	4.1	4.4	4.2
Free: Inherited	0.8	1.0	0.9
Free	1.6	1.1	1.4
Purchased (Owner occupied)	1.7	1.3	1.5
Rent: Company	1.6	0.8	1.2
Rent: BHC	0.8	0.8	0.8
Rent: Council	0.7	1.2	0.9
Rent: VDC	0.4	0.6	0.5
Government Donated	0.6	1.1	0.8
Privately Donated	0.1	0.1	0.1
Do not know	0.2	0.1	0.2
TOTAL	100	100	100

Housing Unit Tenure by Work Activity and Sex

According to 2022 PHC data, **Table 7 (b)** shows that majority of male headed households were staying in rented housing units across all work activities except members of producer cooperatives and those working at their own agricultural activities. Seconded by self –built (owner-occupied) except member of producer cooperative and those working at own agricultural activities. On the contrary, majority of women stayed in self–built (owner-occupied) housing units across work activities except those employed paid in cash.

According to this analysis, most male headed households stayed in rented houses despite the type of work activity they were involved in. It is interesting to note that an overwhelming proportion (77.2%) of those males working in their own agricultural activities stayed in their own houses. This is true because at the cattle posts or lands there were no houses for renting, hence one has to build and stay in their own house. The same situation is found with members of producer cooperatives with 40% staying in their own houses. This may be attributed to the fact that most producer cooperatives are engaged in agricultural activities like crop farming and animal husbandry. The results show that female headed households stayed in their own self-built houses, this may be owing to the fact that women like custom-made spaces, hence they want houses that are to their standards and specifications and also the fair tenure policies and regulations that empower women.

Basic services

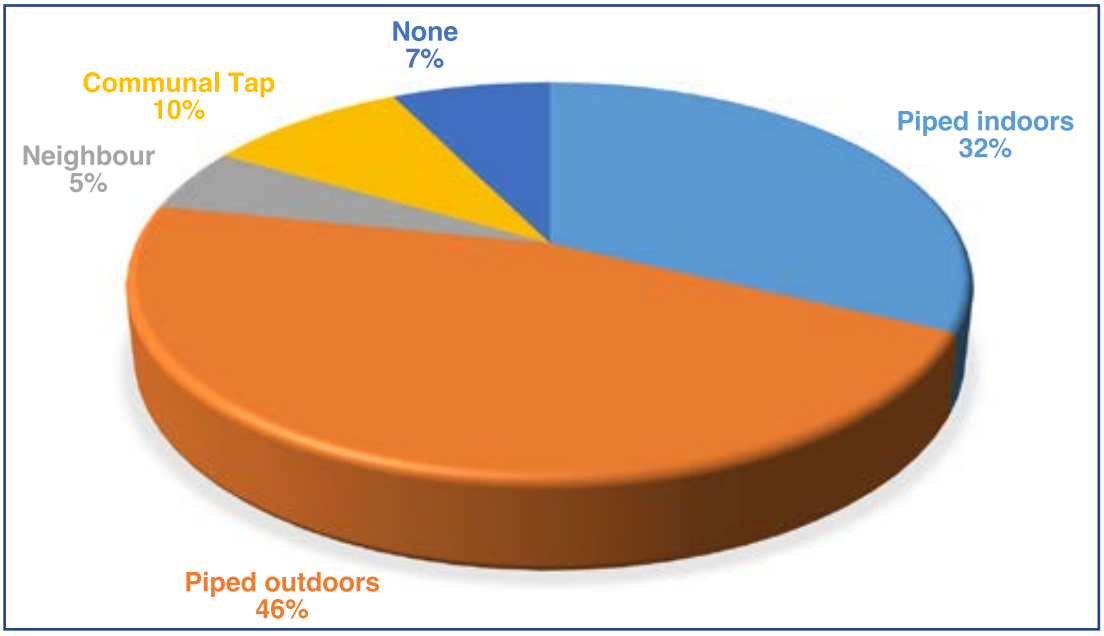
Variables that were analyzed under basic services include main source of drinking water infrastructure and principal source of energy for cooking which were each correlated with work activity.

Main Source of Water for Drinking

Figure 7 shows that majority of households have drinking piped outdoors constituting 46.1% followed by piped indoors with 32. %. This yields a total of 78.2% of drinking water found in the yard. It was a slight increase as recorded by Rakgoasi (2014) for 2011 PHC to 78.2% recoded for 2022 PHC. About 10% of households obtained drinking water for communal pipe while 5% uses neigbours. Although this is a good progress in terms of provision of drinking water, there is a concern about the 7% households who do not have access to water. Rakgoasi (2014) had recorded a proportion of 9.5% households without main source

of drinking water in 2011 PHC therefore there was a decrease of 2.5%). However, further analysis on 2022 PHC has shown that those with no main source of drinking water use other sources such boreholes (40%) with the highest proportion followed by tankers (11.5%), water utilities (10.3%) then rivers, bousers, dams/ pans etc. In terms locality, futher analysis has shown that households without main source for drinking are mostly in rural areas (85.6%), followed by urban village (13.1% and lastly urban areas with 1.3%.

Figure 7: Proportions of main source of drinking water for 2022



Main Source of Drinking Water by Work Activity and Locality

Table 8 reveals that in urban areas, majority of households across all work activities have piped water indoors in their housing units except employees paid in kind, those doing apprentice work and volunteer/ Tirelo Sechaba/Interns who mostly had outdoor water pipes. These are work activities with low or no income. These were followed by those with piped outdoor except the three groups above who had piped drinking water indoors as the second most common source. The principal source of water for drinking showed that majority of those with better income or resources affords piped water indoors than others. In some households whose heads worked as employee- paid in kind, member of consumer cooperative and unpaid family helper in business all had access to some type of main source for drinking water.

In urban villages, there is a switch between piped indoor and piped outdoor drinking water across work activities. Majority of those employed -paid in cash, self -employed (with employees) and member of producer cooperative had piped indoor drinking water while the rest of other work activities commonly got their water from piped outdoor sources.

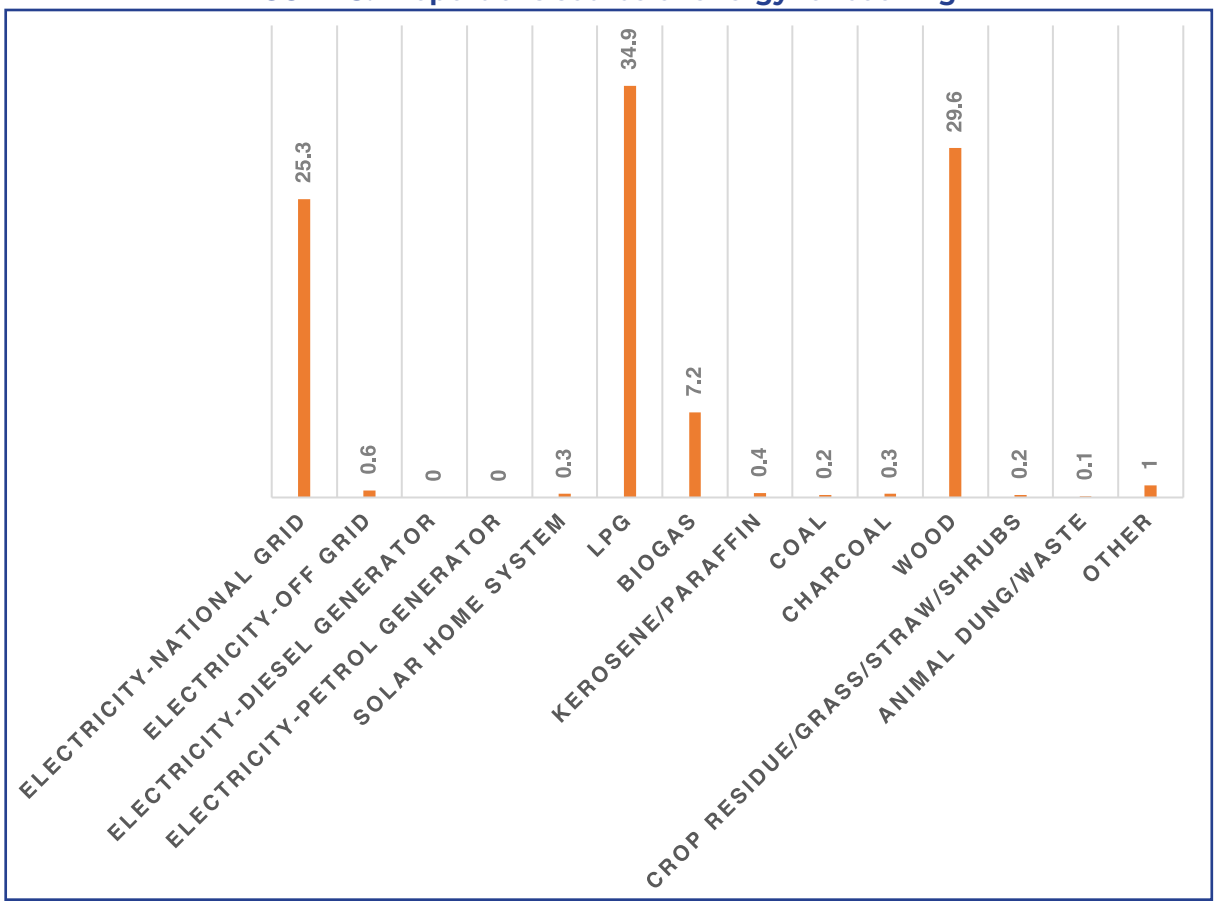
In rural areas, majority have piped water outdoor except for self –employed (with employees) who were in majority for piped water indoors. The second most common source of drinking water in rural areas was communal taps for most work activities except for employee paid cash whose second best source of water was piped indoor, while employee paid in kind (22.5%), unpaid family helper in family business (22.5%) and those working in their own agricultural activities (30.4%) had no source of water scoring the second highest. Though they seem not to have water, further analysis showed that water from other sources such as boreholes, rivers, dams were used. This is true if all these work activities are found in agricultural activities (lands/cattle posts) where boreholes are the main source of water currently.

Principal Source of Energy for Cooking

Figure 8 reveals that most of the households (34.9%) use LPG (gas) as a principal source of energy for cooking followed by wood accounting for 29.6%. Electricity was the third most used source of energy for cooking with 25.3%. Use of biogas was still low at 7.2% and petrol and diesel generators were not used at all for cooking energy. According to Rakgosi (2014) use of wood was a dominant source of energy (41.6%) in 2011 PHC followed by LPG with 38.2% but there was a change of positions between wood and LPG in 2022 PHC as use of wood dropped significantly giving LPG dominance. The use of electricity for cooking has increased from 18.0% in 2011 PHC to 25.3% in 2022 PHC.

Rakgoasi (2014) had also found that proportion of households using wood for cooking was slightly higher among female headed households (44.3%) than male headed households (39.1%) while the proportion that uses gas for cooking is marginally higher among male headed households (39.4%) than female headed households (36.9%). A slightly higher proportion of male headed households (18.9%) use electricity for cooking compared to female headed households (16.9%). This has completely changed in 2022 PHC m as futher analysis has shown that male headed households dominates across all principal source of energy for cooking.

FIGURE 8: Proportions source of energy for cooking



Principal Source of Energy for Cooking by Work Activity and Locality

Table 9 reveals that in urban areas, majority of households use LPG as a principal source of energy for cooking across all work activities done 7 days prior to census followed by electricity-national grid. Crop residue/grass/waste and animal done waste are not used at all across all the wok activities.

In the urban villages, the principal source of energy for cooking in households was LPG across all work activities except for households whose heads were self-employed (with employees), followed by electricity-national grid. However, the difference in proportion between the principal sources for energy for cooking in urban villages was becoming closer showing a contention between the two. Animal dung/waste was not

used at all but crop residue/grass/straw/shrubs were in households whose heads work at own agricultural activities although with insignificant proportion of 0.1%. In urban and urban villages, the most commonly used source of energy for cooking is LPG followed by electricity national grid. This is because most household members are working and can afford to buy gas or electricity. In addition, it is not easy to find wood or biogas in urban and urban villages hence the usage of LPG and electricity national grid.

In the rural areas the most common principal source of energy for cooking was wood firewood across all work activities except those whose house heads were self -employed (with employees), followed by LPG. The reason for this may be attributed to the fact that many households in rural areas don't have enough income to buy gas or electricity while wood is the cheapest and probably readily available source of energy for cooking. In some instances even if they have money LPG and electricity may not be easily accessed.

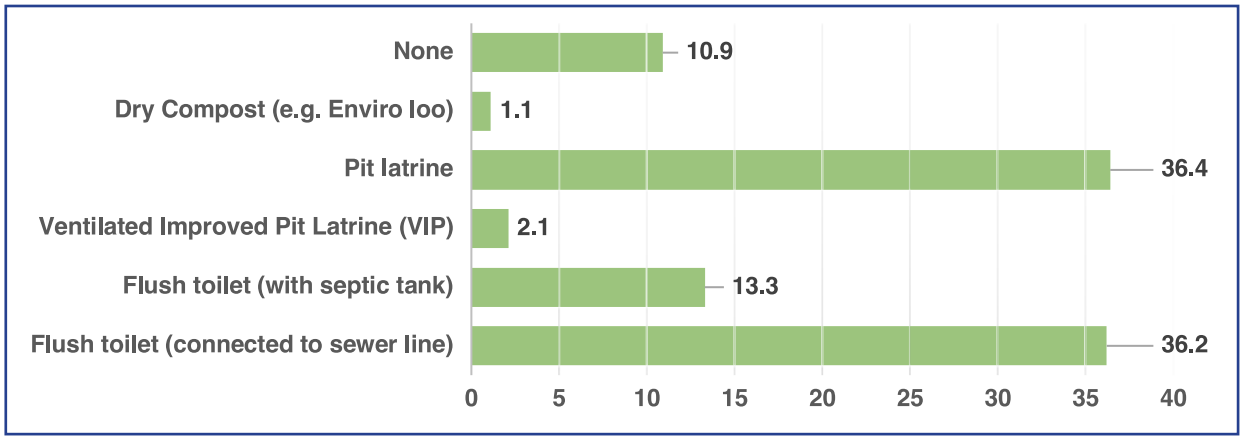
Sanitation

Toilet availability and mode of refuse disposal were the two variables that were analysed under sanitation in this paper and each was correlated with work activity.

Toilet Availability

Figure 9 shows that 89.1% of households has toilets and only 10.9% did not have. The majority pit latrines constituting 36.4% followed by flush toilets (connected to sewer line) constituting 36.2%, a difference of 0.2% showing strong contention between the two. These were followed by flush toilet (with septic tank). The majority of those who did not have toilets were found in rural areas constituting 88.2%, followed by urban villages with 11.0% and urban areas with 0.9%.

FIGURE 9: Proportions of toilet availability for 2022



Toilet Availability by Work Activity and Locality

Table 10 reveals that flush toilets (connected to sewer line) were the most common in urban areas across all work activities, followed by pit latrines across all work activities as well. This is an expected outcome as it is a requirement in urban areas that households connect to sewer line. It is commendable that all household whose heads were self- employed with and without employees had some type of a toilet but a lower proportion of households did not have toilets across other work activities.

In urban villages, flush toilets (connected to sewer line) were common for household heads who were employees - paid in cash, self-employed (with employees) and member of producer cooperative. However, the rest of other work activities commonly use pit latrines.

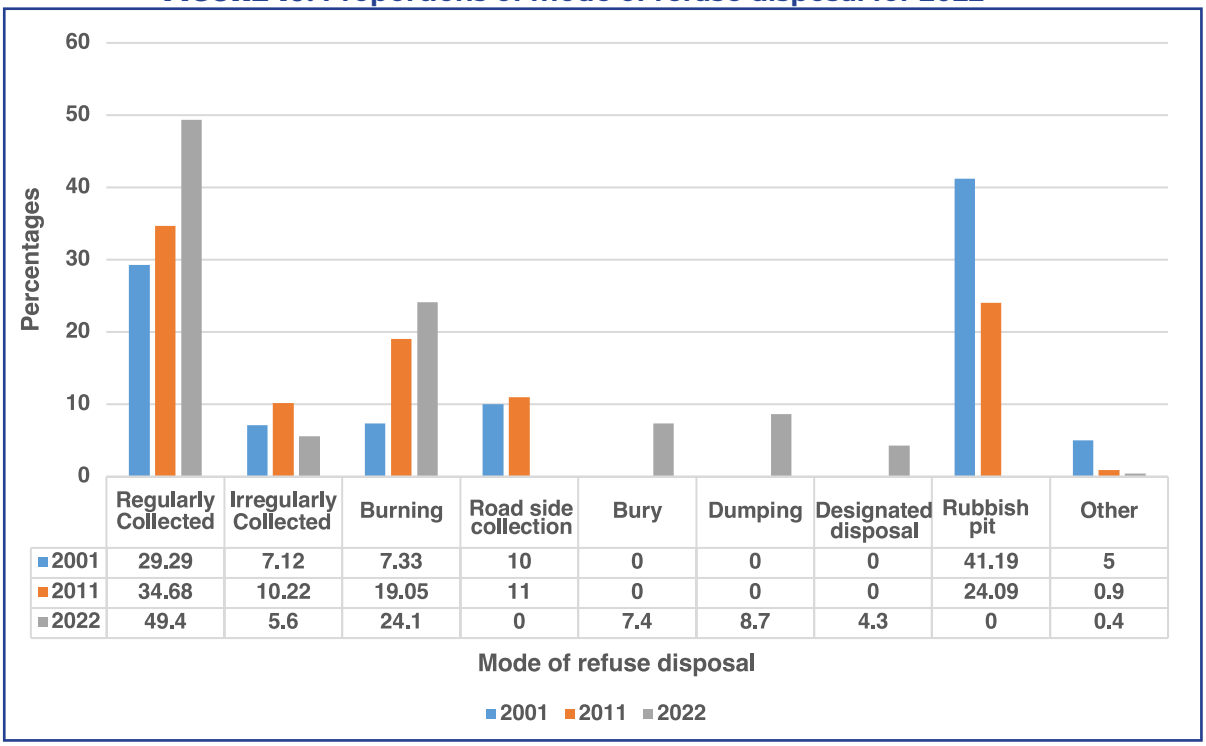
In rural areas, most commonly used toilet was pit latrines across all work activities but there were those households without toilets. The higher proportions of none availability of toilet was found in households whose heads worked at own agricultural activities(lands/cattleposts) constituting 41.7% equivalent to pit latrines, followed by unpaid family helper in family business, employee paid in kind, apprentice and volunteer/Tirelo sechaba/Intern in a range from 31.8% to 36.3%.

Generally, type of toilet is not influenced by the type of work activity the household head did in the previous seven days rather, it was influenced by the locality since availability of infrastructure is much influenced by locality.

Mode of Refuse Disposal

Figure 10 shows the increase in proportion of regular collection of refuse from households in 2001 PHC (29.29), 2011PHC (34.68) and 2022 PHC with 49.4%. This is a good progress by sanitation authorities. This has reduced the irregular collection significantly. However, there is a concern with an increase in burning across the three censuses as this may harm the environment especially that there is no monitoring of what is burnt. Burying also is gaining ground and it will be a welcome method if biodegradable materials are buried otherwise the environment will be harmed overtime. Rubbish pit was excluded in the 2022 PHC questionnaire.

FIGURE 10: Proportions of mode of refuse disposal for 2022



	Regularly Collected	Irregularly Collected	Burning	Road side collection	Bury	Dumping	Designated disposal	Rubbish pit	Other
2001	29.29	7.12	7.33	10	0	0	0	41.19	5
2011	34.68	10.22	19.05	11	0	0	0	24.09	0.9
2022	49.4	5.6	24.1	0	7.4	8.7	4.3	0	0.4

Mode of Refuse Disposal by Work Activity and Locality

Table 11 shows that mode of refuse disposal in urban areas was mostly regularly collected across all work activities ranging from 89.8% and 100%. It is commendable that households with heads that were members of producer cooperative were regularly having collections constituting 100%.

In urban villages, majority of households had regular collection of refuse across all work activities ranging from 37.9% to 61.2% except those who worked at own agricultural activities (lands/cattlepost) which recorded 27.8%. Those working at own agricultural activities commonly burnt their refuse recording 29.3% which had a marginal difference with regular collection.

In the rural areas, majority of households had regular collection across all work activities. Differences are found on seconders as some burnt, others buried while others dumped refuse.

Generally, regular collection is mostly used across different locality and the urban areas yields higher proportions, followed by urban villages and lastly rural areas. The work activity the household head did in the previous 7 days seems did not affect the mode of refuse disposal used in a households instead it depends on the locality.

Policy Implications

1. Botswana has made good progress in terms of provision of adequate housing as per SDG 11, target 1.11 though there is still a lot to be done to reach our goals to 2030.

2. In terms of housing tenure issues, there is a good progress in empowering women, however, the policies have ignored men such that women have overtaken men when it comes to house ownership. There should be a balance between men and women empowerment policies.

3. The use of biogas and solar power as sources of energy for cooking must be encouraged to take advantage of these at the same time reducing emission of harmful gases to the ozone hence positively contributing to reduction of climate change.

4. There is need for provision of sewage infrastructure across all localities to prevent contamination of underground water which is the most common source of drinking water in the country.

CONCLUSIONS

Detached housing units are commonly used and increasing with each census. However, shacks have significantly decreased in urban areas but trends show that they are increasing in rural areas.

In general, households are committed to building good quality houses irrespective of the type of work they engaged in for the past seven days which gives assurance to achieving adequate housing through the spirit of self- reliance.

Durable building materials are mostly used for building houses in Botswana indicating progress towards attaining adequate housing.

Majority of the house units are small as housing unit size was 1 to 3 rooms with the dominance of 1 room. Majority of male headed households stayed in rented housing units across all work activities while majority of female headed households stayed in self-built owner occupied.

Purchasing of housing units remained unchanged from previous PHC.

The most common source of energy for cooking in Botswana, both in urban and urban villages across all work activities is LPG (gas) followed by electricity from the national grid. However, in rural areas, the most common source of energy for cooking is wood followed by gas.

The most common toilet in urban areas is flush toilets (sewer line) followed by pit latrines while in urban villages and rural areas pit latrines are dominant followed by flush toilets with septic tanks. However, there were those who do not have toilets across localities.

Regular collection of refuse from households has significantly increased and because it is obtained by registered entities it assures of appropriate disposal to dumping sites but burying and burning are also on the increase.

RECOMMENDATIONS

Building controls and standards must be implemented in rural areas to ensure that people satisfy certain standards when constructing or building their houses. This can curb the increase of shacks in rural areas.

Authorities responsible for housing matters must monitor closely to reduce increase in shacks.

Government already has a piloted programme to encourage use of biogas but its roll out to individuals is slow hence a few people use it. We recommend that the roll out must be stepped up.

There is a need for the Government to make a programme to encourage individual households on the use of solar power as a sources of energy for cooking. We note that the Government recently launched a project for the construction of a solar power plant in Mmadinare village, however, it is important for individual households to adopt solar power usage.

Building or provision of a toilet must be made mandatory for all establishment including at own agricultural establishments (lands/cattle post) for sanitation purposes. In addition all households in urban areas and urban villages must have flush toilets.

Sewerage systems services must be provided in all urban areas and urban villages to encourage households to migrate from pit latrine type of toilets to flush toilet to safeguard underground water.

The construction of pit latrines must have standards to prevent contamination of underground water.

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APPENDICES

TABLE 1: Proportion Of Type Of Housing Unit By Locality For 2022

	URBAN	URBAN VILLAGE	RURAL	TOTAL
Traditional	0.1	0.9	15.3	**5.7**
Mixed	1.0	12.0	27.2	**14.9**
Detached	57.1	53.8	34.4	**47.9**
Semi- Detached	4.2	5.3	2.3	**4.0**
Town House/Terraced	3.4	1.0	0.3	**1.3**
Flats, Apartment	5.9	1.3	0.2	**1.9**
Part Of Commercial Building	0.0	0.0	0.0	**0.0**
Movable	0.0	0.1	0.4	**0.2**
Shack	0.3	0.4	7.4	**2.8**
Rooms	27.4	24.7	11.8	**20.9**
None	0.5	0.6	0.6	**0.6**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 2: Proportion Of Type Of House By Work Activity

TYPE OF HOUSE	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
Traditional	2.9	8.9	2.5	0.8	1.4	4.5	8.0	11.7	21.2	**4.1**
Mixed	8.1	16.4	11.1	5.2	18.6	19.1	24.0	22.4	33.0	**10.3**
Detached	51.0	37.3	52.5	67.4	58.6	39.9	40.6	39.8	29.6	**50.1**
Semi- Detached	6.7	7.1	3.1	4.2	1.4	2.8	2.6	2.3	0.4	**5.6**
Town House/Terraced	1.7	1.0	1.2	4.9	3.4	-	0.5	1.1	0.2	**1.6**
Flats,Apartment	3.3	1.1	1.0	5.3		0.6	0.5	0.5	0.1	**2.8**
Part Of Commercial Building	0.0	0.4	0.0	0.1	0.7	0.6		0.1	0.0	**0.0**
Movable	0.3	0.1	0.1	0.1	-	-	0.1	0.3	0.3	**0.2**
Shack	3.2	4.9	1.2	0.5	2.1	2.8	0.9	8.5	7.0	**3.1**
Rooms	22.5	21.9	26.8	11.2	13.8	29.8	22.5	12.9	7.5	**21.6**
None	0.5	0.8	0.5	0.3	-	-	0.4	0.5	0.5	**0.5**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 3: Proportion Of Main House Material And Work Activity

MAIN HOUSE WALL	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/CATTLE-POSTS	TOTAL
Conventional Bricks/Blocks	90.0	80.3	92.7	95.5	93.1	87.6	85.6	73.4	65.7	**88.8**
Mud Bricks/Blocks	3.8	8.2	4.0	2.8	1.4	6.7	7.7	9.6	15.4	**4.7**
Mud And Poles/Cow Dung/ Thatch/Reeds/Bottles	1.4	4.0	1.2	0.3	2.1	1.7	4.5	5.4	8.4	**1.9**
Poles And Reeds/Straw	0.1	0.4	0.1	0.1	0.0	0.0	0.3	0.3	1.4	**0.2**
Corrugated Iron/Zinc/Tin	3.8	6.2	1.6	0.7	3.4	3.4	1.4	10.0	7.8	**3.7**
Asbestos	0.3	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	**0.2**
Wood	0.2	0.3	0.1	0.1	0.0	0.0	0.1	0.6	0.5	**0.2**
Stone	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.1	**0.0**
Other	0.3	0.4	0.1	0.3	0.0	0.6	0.3	0.3	0.6	**0.3**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 4: Proportion of floor material by work activity

FLOOR MATERIALS	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
Cement	49.5	58.7	62.3	29.3	45.5	77.0	74.8	59.2	60.0	**51.5**
Floor Tiles	45.6	29.2	34.6	69.3	51.7	16.3	18.3	22.5	15.2	**42.5**
Mud	2.0	5.5	1.5	0.5	1.4	3.4	3.2	7.5	12.1	**2.6**
Mud/Dung	0.9	2.7	0.8	0.2	0.7	1.1	2.5	4.2	6.8	**1.3**
Wood	0.2	0.2	0.1	0.3	-	-	-	0.7	0.1	**0.2**
Brick/Stones	0.1	0.1	0.1	0.1	-	0.6	0.1	0.3	0.2	**0.1**
None	1.4	3.3	0.5	0.1	0.7	1.1	1.0	5.2	5.1	**1.5**
Other	0.3	0.3	0.2	0.2	-	0.6	0.2	0.3	0.6	**0.3**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 5: Proportion of roofing material by work activity

ROOFING MATERIALS	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUC-ER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
Slate	0.7	2.0	0.6	1.0	0.7	0.6	0.3	0.3	0.4	**0.7**
Thatch/Straw	2.0	6.8	2.0	1.6	2.8	5.6	5.5	6.3	14.1	**2.9**
Roof Tiles	19.3	16.0	17.0	43.6	26.2	6.2	9.0	14.2	10.1	**19.1**
Corrugated Iron/Zinc/Tin	76.4	74.6	79.4	51.6	69.0	87.6	84.6	78.8	74.6	**75.9**
Asbestos	0.9	0.2	0.6	0.8	-	-	0.3	0.1	0.1	**0.8**
Concrete	0.3	0.1	0.2	1.0	1.4	-	0.0	-	0.1	**0.3**
Other	0.4	0.2	0.2	0.3	-	-	0.1	0.2	0.6	**0.3**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 6: Proportion of housing unit size by work activity

NO. OF ROOMS	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER CORPORATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
1	37.0	42.9	36.3	17.2	30.3	52.2	36.1	33.8	28.9	**35.7**
2	27.8	26.2	27.7	22.5	24.1	24.2	28.5	24.3	28.9	**27.7**
3	20.9	16.2	19.2	28.5	24.8	9.6	18.9	19.2	20.8	**20.9**
4	8.8	8.1	9.5	17.4	6.9	7.9	10.1	12.5	11.0	**9.4**
5	3.0	3.2	3.9	7.3	7.6	2.2%	3.5	5.6	5.6	**3.5**
6	1.3	1.6	1.7	3.6	2.8	2.2	1.4	2.5	2.5	**1.5**
7	0.5	0.6	0.8	1.6	2.1	1.1	0.6	0.5	1.2	**0.7**
8	0.2	0.3	0.5	0.8	0.7	0.6	0.4	0.9	0.6	**0.3**
9	0.1	0.3	0.2	0.4	0.0	-	0.3	0.2	0.2	**0.2**
10	0.1	0.2	0.1	0.3	0.0	-	0.1	0.2	0.1	**0.1**
11	0.0	0.0	0.0	0.1	0.0	-	0.0	0.2	0.0	**0.0**
12	0.0	0.1	0.0	0.1	0.7	-	0.1	-	0.0	**0.0**
13	0.0	0.1	0.0	0.0	0.0	-	-	-	0.0	**0.0**
14	0.0		0.0	0.0	-	-	-	-	0.0	**0.0**
15	0.0	0.1	0.0	0.1	-	-	-	-	-	**0.0**
16+	0.0	0.1	0.0	0.0	-	-	-	-	-	**0.0**
TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 7(B): Proportion of housing unit tenure by work activity an

HOUSING TENURE		EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
Male	Self-built (Owner-occupied)	20.3	30.4	26.6	27.2	40.0	28.9	31.6	41.6	77.2	**25.6**
	Family home	9.1	16.0	16.4	11.6	13.3	14.1	23.7	40.4	17.2	**11.0**
	Rent Individual	37.2	32.4	48.8	43.9	33.3	42.2	32.8	8.5	1.4	**36.6**
	Free(job related)	14.9	10.3	1.5	1.5	5.3	3.7	1.3	4.0	1.0	**11.3**
	Rent Government	7.7	3.2	0.7	1.2	1.3	-	1.0	0.2	0.2	**5.8**
	Free: Inherited	0.5	1.1	1.0	0.7	-	3.0	1.3	1.2	0.9	**0.6**
	Free	1.6	1.9	1.8	0.8	1.3	3.7	3.8	2.4	0.9	**1.6**
	Purchased (Owner occupied)	1.9	1.2	1.4	9.1	4.0		0.8	0.6	0.5	**2.1**
	Rent: Company	2.8	1.3	0.5	1.9	1.3	3.0	0.5	0.4	0.0	**2.2**
	Rent: BHC	1.3	0.3	0.6	1.7	-	-	-	-	0.1	**1.1**
	Rent: Council	1.4	0.7	0.2	0.2	-	0.7	-	-	0.0	**1.0**
	Rent: VDC	0.7	0.5	0.2	0.1	-	-	0.5		0.1	**0.5**
	Government Donated	0.3	0.7	0.2	0.1	-	-	2.3	0.4	0.4	**0.3**
	Privately Donated	0.1		0.1	0.0	-	-	0.2		0.0	**0.1**
	Do not know	0.2	0.1	0.1	0.1	-	0.7	0.2	0.2	0.1	**0.2**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 8: Source of drinking water by work activity

MAIN SOURCE OF DRINKING WATER		EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/CATTLE-POSTS)	TOTAL
URBAN	**Piped Indoors**	67.3	43.3	53.3	90.3	58.8	32.1	38.5	66.1	72.3	**66.7**
	Piped Outdoors	30.5	54.5	43.3	8.3	41.2	60.7	56.6	33.9	21.5	**31.1**
	Neighbors Tap	1.2	0.8	2.2	0.5	-		4.2	-	2.0	**1.3**
	Communal Tap	0.6	1.4	0.8	0.4		3.6	0.5	-	0.3	**0.6**
	None	0.4	-	0.4	0.4	-	3.6	0.2	-	3.9	**0.4**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
URBAN VILLAGE	**Piped Indoors**	51.0	40.7	37.2	65.6	47.8	27.6	26.9	42.4	38.5	**48.5**
	Piped Outdoors	40.9	50.7	52.6	27.4	37.3	64.4	58.2	44.8	51.9	**43.0**
	Neighbors? Tap	2.2	3.6	3.5	1.6	4.5	4.6	6.3	3.4	4.0	**2.5**
	Communal Tap	3.9	3.7	4.9	3.1	6.0	2.3	6.3	6.9	3.7	**4.1**
	None	2.0	1.4	1.9	2.2	4.5	1.1	2.3	2.4	1.8	**2.0**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
RURAL	**Piped Indoors**	25.7	19.1	17.8	42.5	11.4	4.8	6.6	10.2	7.9	**21.6**
	Piped Outdoors	34.1	27.8	42.0	30.6	59.1	33.3	42.4	36.7	31.6	**34.4**
	Neighbors? Tap	7.5	12.2	10.2	4.9	6.8	23.8	19.3	9.3	8.0	**8.0**
	Communal Tap	15.5	18.4	17.8	10.8	13.6	25.4	25.9	21.4	22.2	**17.0**
	None	17.3	22.5	12.2	11.3	9.1	12.7	5.8	22.5	30.4	**19.0**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 9: Principal source of cooking energy and work

LOCALITY	PRINCIPAL SOURCE OF ENERGY FOR COOKING	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/CATTLE-POSTS)	TOTAL
URBAN	Electricity-National Grid	34.5	24.2	31.1	49.1	29.4	21.4	22.4	39.3	37.1	**34.8**
	Electricity-Off Grid	0.6	0.2	0.4	0.5				3.6		**0.5**
	Electricity-Diesel Generator	0.0	0.2	-	0.1	-	-	-	-	-	**0.0**
	Electricity-Petrol Generator	0.0	-	0.0	0.0	-	-		-	-	**0.0**
	Solar Home System	0.2	0.2	0.2	0.4	-	-	-	-	-	**0.2**
	LPG	53.9	56.7	53.4	43.4	44.1	53.6	56.9	44.6	42.7	**53.3**
	Biogas	7.9	13.4	9.7	4.9	17.6	14.3	7.2	5.4	7.8	**8.0**
	Kerosene/paraffin	0.2	0.6	0.4	0.1	-	-	1.6		0.3	**0.2**
	Coal	0.0	-	0.0	0.0	-	-	-	1.8	-	**0.0**
	Charcoal	0.0	-	0.1	0.0	-	-	0.2			**0.0**
	Wood	1.8	3.8	3.7	0.7	-	7.1	11.0	1.8	11.7	**2.0**
	Crop residue/grass/straw/shrubs	0.0		0.0	-	-	-	-	-	-	**0.0**
	Animal dung/waste	0.0			-	-	-	-	-	-	**0.0**
	Other	0.9	0.6	1.1	0.8	8.8	3.6	0.7	3.6	0.3	**0.9**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
URBAN VILLAGE	Electricity-National Grid	34.9	31.7	32.8	42.0	38.8	31.0	27.8	31.7	23.9	**34.4**
	Electricity-Off Grid	0.7	1.4	0.5	0.9	1.5		0.6	0.7	0.6	**0.7**
	Electricity-Diesel Generator	0.0	-	0.0	0.1	-	-		0.3	-	**0.0**
	Electricity-Petrol Generator	0.0	-	0.0	0.0	-	-	-	-	-	**0.0**
	Solar Home System	0.2	0.1	0.2	0.4	1.5	1.1	0.1	0.3%	0.1%	**0.2**
	LPG	46.6	44.3	44.4	43.1	34.3	33.3	35.3	36.6%	32.6%	**45.6**
	Biogas	9.2	5.8	8.9	8.1	9.0	6.9	7.1	9.0%	5.5%	**9.0**
	Kerosene/paraffin	0.2	0.6	0.2	0.1	-	-	0.5	1.0%	0.4%	**0.2**
	Coal	0.1	-	0.1	-	-	-	-	-	0.1	**0.1**
	Charcoal	0.1	0.2	0.1	0.1			0.2	0.3	0.3	**0.1**
	Wood	7.2	15.1	12.2	4.6	14.9	27.6	26.8	20.0	36.1	**9.0**
	Crop residue/grass/straw/shrubs	0.0	0.1	0.0	-	-	-	-	-	0.1	**0.0**
	Animal dung/waste	0.0	-	0.0	-	-	-	-	-	0.0	**0.0**
	Other	0.8	0.8	0.5	0.7	-	-	1.7		0.3	**0.7**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 9 CONT'D: Principal source of cooking energy and work

LOCALITY	PRINCIPAL SOURCE OF ENERGY FOR COOKING	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/CATTLE-POSTS)	TOTAL
RURAL	**Electricity-National Grid**	18.5	11.9	18.6	26.	20.5	9.5	10.3	8.3	5.3	**16.0**
	Electricity-Off Grid	0.4	0.2	0.3	0.	-	-	0.2	-	0.1	**0.3**
	Electricity-Diesel Generator	0.1	-	0.0	0.1	-	-	-	-	0.0	**0.1**
	Electricity-Petrol Generator	0.0	-	0.0	0.2	-	-	-	-	0.0	**0.0**
	Solar Home System	0.4	0.5	0.3	0.8	2.3	-	0.1	0.9	0.3	**0.4**
	LPG	20.4	11.9	19.4	35.7	27.3	14.3	11.6	9.6	7.2	**18.0**
	Biogas	5.0	4.7	4.8	7.4	15.9	-	3.1	3.4	1.5	**4.4**
	Kerosene/paraffin	0.4	1.3	0.6	0.4	-	-	0.7	0.4	0.4	**0.4**
	Coal	0.2	0.6	0.2	0.1	-	-	0.5	0.2	0.2	**0.2**
	Charcoal	0.5	0.7	0.5	0.2	-	3.2	0.3	0.2	0.5	**0.5**
	Wood	52.5	65.3	53.8	27.8	34.1	71.4	71.6	75.2	82.7	**58.1**
	Crop residue/grass/straw/shrubs	0.4	0.9	0.3	-	-	-	0.3	0.8	0.6	**0.4**
	Animal dung/waste	0.1	0.5	0.2	-	-	-	0.3	0.2	0.2	**0.2**
	Other	1.0	1.6	1.0	0.7	-	1.6	1.0	0.8	1.0	**1.0**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	100.0

TABLE 10: Proportion of toilet availability by work activity and locality

LOCALITY	TOILET AVAILABILITY	EMPLOYEE – PAID CASH	EMPLOYEE – PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/ CATTLE-POSTS)	TOTAL
URBAN	Flush toilet (connected to sewer line)	87.4	81.2	82.9	93.0	88.2	82.1	73.2	92.9	83.1	**87.1**
	Flush toilet (with septic tank)	4.5	4.0	4.6	4.%	5.9	3.%	4.4	1.8	1.6	**4.5**
	Ventilated Improved Pit Latrine (VIP)	0.8	0.4	1.1	0.5	2.9	3.6	1.9	-	1.3	**0.8**
	Pit latrine	7.0	13.6	10.8	1.8		7.1	19.3	5.4	9.8	**7.3**
	Dry Compost (e.g. Enviro loo)	0.0	-	0.1	-	-	-	-	-	0.3	**0.0**
	None	0.3	0.8	0	0.0	2.9	3.6	1.2		3.9	**0.3**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
URBAN VILLAGE	Flush toilet (connected to sewer line)	41.5	34.3	32.9	45.3	44.8	28.7	23.7	30.0	21.8	**39.4**
	Flush toilet (with septic tank)	22.9	19.6	18.0	29.9	13.4	9.2	12.1	17.9	20.7	**22.1**
	Ventilated Improved Pit Latrine (VIP)	2.0	3.4	2.5	1.4	4.5	4.6	3.7	3.4	3.5	**2.2**
	Pit latrine	31.6	40.3	44.1	22.2	34.3	49.4	55.2	43.4	50.1	**34.2**
	Dry Compost (e.g. Enviro loo)	0.2	0.6	0.2	0.1	-	1.1	0.3	1.7	0.2	**0.2**
	None	1.8	1.8	2.3	0.9	3.0	6.9	5.0	3.4	3.7	**1.9**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
RURAL	Flush toilet (connected to sewer line)	13.4	8.9	7.6	16.2	13.6	1.6	3.0	4.7	3.0	**10.8**
	Flush toilet (with septic tank)	19.	9.9	13.1	37.0	22.7	4.8	4.5	7.8	5.6	**16.0**
	Ventilated Improved Pit Latrine (VIP)	2.1	1.9	2.9	2.4	6.8	6.%	2.6	2.1	3.5	**2.4**
	Pit latrine	40.0	39.8	55.2	35.1	36.4	52.4	56.8	45.6	41.7	**41.9**
	Dry Compost (e.g. Enviro loo)	2.2	4.1	1.6	0.8	6.	1.6	1.3	3.6	4.4	**2.5**
	None	23.2	35.4	19.6	8.6	13.6	33.3	31.8	36.3	41.7	**26.2**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

TABLE 11: Proportion of mode of refuse disposal by work activity and locality

LOCALITY	MODE OF REFUSE DISPOSAL	EMPLOYEE - PAID CASH	EMPLOYEE - PAID IN KIND	SELF-EMPLOYED (NO EMPLOYEES)	SELF-EMPLOYED (WITH EMPLOYEES)	MEMBER PRODUCER COOPERATIVES	APPRENTICE	VOLUNTEER / TIRELO SECHABA / INTERN	UNPAID FAMILY HELPER IN FAMILY BUSINESS	WORKING AT OWN AGRICULTURAL ACTIVITIES (LANDS/CATTLE-POSTS)	TOTAL
URBAN	Regularly Collected	93.7	89.8	95.2	93.1	100.0	92.9	91.6	91.1	90.9	**93.8**
	Irregularly Collected	5.2	10.0	3.8	5.7		7.1	6.5	7.1	4.2	**5.1**
	Burning	0.3	-	0.3	0.2	-	-	0.5	1.8	2.9	**0.3**
	Bury	0.0	-	0.0		-	-	-	-	0.7	**0.0**
	Dumping	0.2	0.2	0.3	0.3	-	-	0.7	-	0.7	**0.3**
	Designated disposal	0.5	-	0.2	0.7	-	-	0.5	-	0.7	**0.5**
	Other	0.0	-	0.1	0.0	-	-	0.2	-		**0.0**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	100.0
URBAN VILLAGE	Regularly Collected	60.2	51.0	49.8	61.3	61.2	37.9	40.4	44.1	27.8	**57.3**
	Irregularly Collected	6.3	5.1	6.4	6.0	1.5	10.3	5.5	8.6	5.8	**6.3**
	Burning	17.3	21.5	24.2	13.3	22.4	31.0	30.1	23.8	29.3	**18.8**
	Bury	3.5	5.8	5.1	2.3	3.0	3.4	8.8	7.6	11.0	**4.0**
	Dumping	7.8	12.8	9.2	10.4	4.5	8.0	11.0	12.1	17.4	**8.4**
	Designated disposal	4.6	3.4	4.8	6.2	7.5	6.9	3.6	3.8	8.1	**4.8**
	Other	0.4	0.3	0.5	0.6	-	2.3	0.6	-	0.6	**0.4**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	100.0
RURAL	Regularly Collected	24.3	19.9	20.3	25.9	15.9	7.9	19.4	11.0	11.1	**21.4**
	Irregularly Collected	5.6	3.6	5.6	5.0	6.8	11.1	6.6	3.0	3.8	**5.2**
	Burning	38.8	46.6	38.9	29.6	34.1	41.3	37.1	47.1	46.5	**40.2**
	Bury	10.9	12.2	12.4	8.2	18.2	15.9	14.9	17.4	18.8	**12.5**
	Dumping	12.8	12.1	14.2	19.8	20.5	17.5	13.4	14.0	13.6	**13.2**
	Designated disposal	7.0	4.8	8.1	10.8	4.5	6.3	7.8	7.0	5.4	**6.9**
	Other	0.5	0.8	0.4	0.6	-	-	0.8	0.6	0.8	**0.6**
	TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	100.0

2022 POPULATION AND HOUSING CENSUS ANALYSIS ON INVESTIGATING RELATIONSHIPS BETWEEN HOUSING CONDITIONS AND SOCIOECONOMIC AND DEMOGRAPHIC FACTORS IN BOTSWANA

Authors: B. Mokgweetsi[1], K. Sediakgotla[1], B. P. Basebi[2].

EXECUTIVE SUMMARY

Introduction: Housing is crucial for social, economic, and human development, significantly impacting people's quality of life by providing dignity, well-being, and economic stability. Adequate housing, as emphasized by UN-Habitat and OHCHR, must meet specific criteria, including security of tenure, availability of services, affordability, habitability, accessibility, location, and cultural adequacy. Although not constitutionally recognized as a human right in Botswana, the government acknowledges its importance and has implemented the National Policy on Housing (2000) to improve housing for low and middle-income households. Supported by initiatives like Vision 2036, the New Urban Agenda, SDGs, and Agenda 2063, Botswana aims to ensure resilient and inclusive communities with quality housing for all.

Methodology: This study investigates the relationship between housing conditions and socioeconomic and demographic factors in Botswana using 2022 census data, analyzing variables such as housing type, construction materials, and amenities. The results provide insights into housing issues and inform policy recommendations to enhance housing quality and address diverse needs, contributing to better understanding and equitable housing access in similar contexts.

Findings: The study revealed a diverse distribution of housing types, with detached houses being prevalent in urban areas and traditional housing more common in rural regions. Over time, there has been a decline in traditional housing and an increase in modern housing units. Conventional bricks and blocks are found to be the dominant construction materials, reflecting a shift from traditional materials like mud bricks and thatch to more durable options. Housing tenure varies, with self-built homes common in rural areas and rented homes in urban areas. Access to basic services such as safe drinking water and sanitation is significantly better in urban areas compared to rural regions.

Conclusion: The findings from the 2022 Population and Housing Census provide crucial insights into housing conditions and their relationships with various socioeconomic and demographic factors in Botswana. Addressing these disparities through targeted housing policies and promoting sustainable and affordable housing practices will significantly enhance the quality of life for all citizens and support Botswana's national development plans. Proposed policy recommendations include investing in affordable housing, improving access to housing finance, and prioritizing sustainable and affordable housing delivery, particularly for vulnerable and marginalized groups.

1. Introduction

Botswana has at least over the past four decades, undergone significant economic transformation. Notably, the country has momentously transitioned from a least developed country where extreme poverty was rampant and progressed to a Middle-Income status. Today, Botswana is aspiring to have achieve High-Income status with an ambition to be a knowledge-based economy by the year 2036. The country's journey is not only focusing on upgrading the economic status from a Middle-Income to High-Income, rather it also underscores the importance of addressing the challenges related to housing with an endeavour geared towards ensuring sustainable development and improved living conditions of the people towards "achieving prosperity for all by 2036".

This chapter intends to explore the housing sector and explicitly investigate relationships between housing conditions and socio-economic and demographic factors in Botswana. This kind of investigation is imperative for many role players in nation building, including policymakers and policy implementers, urban planners, as well as economic planners as it will form part of guiding tools to help them make informed decisions. The findings of this investigation are to give sustainable solutions to address housing challenges. Various housing variables, such as housing unit type, construction materials, and tenure are examined to explore their associations with socioeconomic and demographic factors, including gender, and education level. Descriptive statistics and cross-tabulations analysis were employed to assess the strength and significance of these relationships.

Housing is a critical component of social, economic, and human development, significantly influencing the quality of life. Adequate housing is fundamental to ensuring the dignity, well-being, and economic stability of individuals and communities. Understanding the relationship between housing conditions and socioeconomic and demographic factors in Botswana is crucial for addressing significant disparities in income and wealth across the population. In this middle-income country, lower-income households often face challenges such as overcrowding, inadequate housing, lack of basic amenities, and poor-quality dwellings. These issues underscore the importance of examining how socioeconomic status influences housing conditions.

1.1 Significance of the Study

This study is vital for informing policies and interventions aimed at improving housing quality and accessibility, particularly for vulnerable or marginalized populations. By analyzing the link between housing conditions and socioeconomic factors, policymakers can design targeted interventions to promote affordable and decent housing. This approach aligns with Botswana's Vision 2036, which aspires to provide quality housing for all.
Policy Implications

1. **Targeted Interventions:** Insights from the study can guide the development of affordable housing programs, subsidies, and incentives to bridge the housing gap, ensuring all populations have access to quality housing.

2. **Demographic Considerations:** Understanding demographic factors such as household size, composition, age, and gender allows policymakers to tailor strategies to meet the diverse needs of different population groups. This includes initiatives for the aged, homeless, youth, graduates, people with disabilities, and the middle-income group.

The study's findings are meant to contribute to the development of inclusive and responsive housing policies that address the unique needs of Botswana's diverse population. By improving housing conditions through well-informed interventions, the country can make significant progress towards achieving its vision's aspirations and enhancing the quality of life for all its citizens and residents.

1.2 Research Objective:

The main objective of this study was to investigate the relationship between housing conditions and socioeconomic and demographic factors in Botswana.

1.3 Specific Objectives

- To do a classification of the type of housing units per district in Botswana.
- To assess the relationship between type of housing unit by educational attainment and gender.
- To assess the relationship between the type of construction material used by economic activity and the educational attainment.
- To do a descriptive analysis of the housing unit amenities such as toilets, availability of bathrooms and kitchens.

2. Literature Review and policy objectives

The relationship between housing conditions and socioeconomic and demographic factors cannot be over emphasized. The office of the United Nations High Commission for Human Rights (OHCHR) and the United Nations Human Settlements Program (UN-Habitat) state that the right to adequate housing is a human right and that it is recognized as a right to an adequate standard of living. These offices also observe that despite this right, a considerable number of people around the world live in life or health threatening conditions or in conditions which do not uphold their human right and dignity. They further argue that, key aspects of the right to adequate housing includes but is not limited to availability of safe drinking water, adequate sanitation, washing facilities, means of food storage refuse disposal and affordability of housing. Although Botswana has not yet ratified housing as a "human right", the Government recognizes housing as an important aspect of social, economic and human development. It is well notable that there has been a tremendous change and shifts in housing types and conditions in Botswana over time. A significant decline in the proportion of traditional type of housing over time has been observed, with only 13% in 2011 as compared to about 64% during the 1991 census (Statistics Botswana technical report 2011). There has been an increase in owner occupied houses in urban areas and the general conditions of houses has improved as now people have moved out of the traditional mud huts to more modern current cement and mortar type of houses.

Amongst other things, the National Policy on Housing (2000), emphasizes the objective of empowering Batswana through home-ownership. This was in part a response to the Act of Parliament (CAP 74.03) of 1971, which established the Botswana Housing Corporation (BHC) whose mandate is to provide housing to Batswana. Targeted home ownership initiatives such as the Instalment Purchase Scheme (IPS), Low-Income Housing Programme (SHHA Home-Improvement, Turnkey Development Scheme and Integrated Poverty Alleviation and Housing Scheme), Tsholofelo Youth Flats and out right sales schemes have been implemented. "70% of the Tsholofelo Youth Flats have been sold to the youth and has allowed the corporation to roll over the turnkey to Block 7 in Gaborone, where a similar development under similar disposal arrangements will be constructed." (BHC annual report 2022).

Vision 2036 aspires for the upliftment of the people and it is so aligned to the global and regional blueprints in the Agenda 2030 – the New Urban Agenda and the Sustainable Development Goals (SDGs) and Agenda 2063 – The Africa We Want. Pillar 2 of the Vision 2036 - "Human and Social Development", advocates for the marginalized population groups to have equal access to service and socio-economic opportunities. In particular, the elderly and the poor will be empowered to have access to all socio-economic opportunities enjoyed by all. Programs and laws including infrastructure development will be reviewed to accommodate them. Furthermore, Pillar 3- "Sustainable Environment" talks of sustainable human settlements, where cities, towns and villages will be made safe and clean, providing decent and affordable housing and economic opportunities for all. Settlements, dwellings and the associated infrastructure and amenities will be planned and designed in an integrated manner to be socially inclusive and economically vibrant.

In response to the above stated international, regional and national instruments, which in part exist to achieve universal and equitable access to safe and affordable drinking water, sanitation and hygiene for all, as well as adequate and affordable housing and basic services, we endeavour to investigate the relationship between housing conditions (house type, construction material, sanitation, refuse disposal and others) and socio-economic and demographic factors such as gender, marital status, education level and disability.

3. Methodology:

The methodology chapter outlines the approach and techniques employed to investigate the relationships between housing conditions and various socioeconomic and demographic factors in Botswana. This section provides a detailed description of the data sources, analytical methods, and key variables used in this study. Understanding these elements is crucial to comprehending the study's findings and their implications.

3.1 Data Source and Analysis:

The methodology of this study leverages comprehensive data from the 2022 Botswana Population and Housing Census to explore the intricate relationships between housing conditions and socioeconomic and demographic factors. Descriptive statistics were employed to summarize the data, providing an overview of housing types, construction materials, tenure, and basic amenities. To delve deeper into these relationships, cross-tabulations were utilized to examine the associations between different variables, highlighting patterns and correlations. The IBM Statistical Package for the Social Sciences (SPSS) version 29 was instrumental in analyzing the BPHC data, providing robust tools for data management, statistical analysis, and graphical representation. SPSS facilitated the efficient processing of large datasets, ensuring accurate and reliable results that underpin the study's conclusions and policy recommendations.

3.2 Study Variables:

The key variables that were analyzed, include housing conditions (e.g., housing unit type, construction materials, and tenure) and socioeconomic and demographic factors (e.g., district, gender, education level, and economic activity).

4. Findings and Discussions

4.1. Type of housing unit by district

In Botswana there are ten classifications for the type of housing as used in the 2011 census. The categories cut across the given districts and the localities and are defined as follows:

(a) **Traditional:** one or more huts in a compound made of mud walls and having a thatched roof.
(b) **(Detached:** a stand-alone building not sharing walls with any other house (excludes traditional houses).
(c) **Semi-detached:** A housing unit that shares a wall with another housing unit.
(d) **Mixed House:** A housing unit is classified as mixed if there are both traditional and modern structures within the yard occupied by one household. When the two units are occupied by two separate households, one traditional and the other modern, units are classified as traditional and modern
(e) **Town House:** A group of units sharing walls on two sides but each having its own entrance. It has two or three storeys.
(f) **Flats, Apartments:** A housing unit in two or more storeyed building and the unit is just one of the storeys.
(g) **Part of commercial building:** A residential unit which forms part of a commercial building
(h) **Movable:** A housing unit that can be moved from place to place as a unit or in parts.
(i) **Shack:** A temporary structure built of packing material
(j) **Rooms:** Rooms in a building that are sublet to tenants and
(k) **None:** No specified housing type.

There are also three classifications for the localities within districts. These are urban, urban villages and rural.

Table 1 shows the localities by the type of housing unit. Within rural areas, 15.3% of the housing units are of the traditional mud and thatch type, 27.2% are mixed type and 11.8% are rooms that are sublet. In urban areas we find 57.1% of predominantly detached housing units followed by rented rooms at 27.4% and flats at 5.9%. The distribution of housing units in urban villages is fairly similar to those in urban areas with 5% detached housing, followed by rented rooms at 27.4% and flats and apartments at 5.9%. The results show

that none of the respondents are living in parts of commercial buildings, and that a notable number is still living in shacks in urban areas. These could possibly be unskilled squatters who migrated into urban areas in search of jobs and ended up in temporary makeshift housing units.

TABLE 1: Percent distribution of housing units by type of locality

TYPE OF HOUSING	URBAN	URBAN VILLAGE	RURAL	TOTAL
Traditional	0.1	0.9	15.3	**5.7**
Mixed	1.0	12.0	27.2	**14.9**
Detached	57.1	53.8	34.4	**47.9**
Semi- detached	4.2	5.3	2.3	**4.0**
Town house/Terraced	3.4	1.0	0.3	**1.3**
Flats, Apartment	5.9	1.3	0.2	**1.9**
Part of commercial building	0.0	0.0	0.0	**0.0**
Movable	0.0	0.1	0.4	**0.2**
Shack	0.3	0.4	7.4	**2.8**
Rooms	27.4	24.7	11.8	**20.9**
None	0.5	0.6	0.6	**0.6**
Total	**149,889**	**306,939**	**238,819**	**695,647**

4.2. Trend distribution of housing type for the 1991, 2001, 2011 and 2022 censuses

A trend comparison by year from 1991 census to 2022 census by housing unit type is given in table 2. There has been a tremendous reduction on the traditional type of housing unit all through from 1991 census at 64.04% to only 5,7% in 2022. Since traditional type of housing are the mud walled and thatch type roofed house, it follows that there has been a shift to brick, mortar and other roof types designs, a fact we shall explore.

There is a significant increase in the detached housing units at 47.9% in 2022 from 34.1% in the 2001 census. A slight reduction from 22.9% in 2011 to 20.9% in 2022 of the rooms sublet to tenants has been observed. Of the 695 647 housing units in 2022, 1.9% of the housing units are flats and apartments. This category has increased from 0.47% in 1991, 0.85% in 2001 and 1.5% in 2011. This may partly be attributable to the tenant purchase scheme of the Botswana housing corporation, where they have reported a positive response to the scheme in their 2022 annual report.

TABLE 2: Percentage distribution of housing type for the 1991, 2001, 2011 and 2022 censuses

TYPE OF HOUSING	1991	2001	2011	2022
Traditional	64.0	22.2	13.2	5.7
Mixed		18.7	10.0	14.9
Detached	20.1	34.1	43.4	47.9
Semi-detached	2.7	4.4	4.6	4.0
Town House/Terraced	1.0	2.8	1.9	1.3
Flats	0.5	0.9	1.5	1.9
Part of Commercial building	0.1	0.2	0.1	0.0
Moveable	1.5	1.2	0.7	0.2
Shack	1.1	1.7	1.7	2.8
Rooms	7.5	13.8	22.9	20.9
Shared	-	0.2	-	-
Other	0.9	0.0	-	-
None	-	0.2	-	0.6
Percentage total	**100.0**	**100.0**	**100.0**	**100.0**
Number of housing units	**276,209**	**404,706**	**550,946**	**695,647**

4.3 Construction material used on the walls, floor and roof of the main house for the household.

The type of construction material used in the construction of housing units is a reflection of a change in lifestyle and an element of pomp, wealth and progress to many. There has been a notable shift in the type of housing units from the traditional mud houses to other types as discussed in **table 2** above. This shift then meant that most housing units are of the cement and mortar type. It is thus of interest to interrogate the type of construction material used on houses.

This section looks at the type of material used for walls as given in **table 3.** Of the 691 814 housing units, 87.1% of them, have their houses built using the conventional bricks and blocks. There has been a tremendous mushrooming of businesses that manufacture stock bricks and blocks in urban and urban villages to support this shift. 5.9 % of the housing units use mud bricks and blocks. A within district comparison shows that housing units with mud bricks and blocks are predominately in the Delta at 31.2%, 9.3% in the Kweneng West, followed by Ngamiland East at 8.6% **(Appendix Table A1)**. 3.4% of all the housing units use corrugated iron, zinc or tin as walls. None of the housing units were observed have been built entirely by stones, save for a 0.3% observed in Kweneng West out of a total of 15 765 housing units in that area. The results indicates that those with Secondary and primary school level of education dominate all other levels with respect to the type of construction material used for walls **(Appendix Table A4)**.

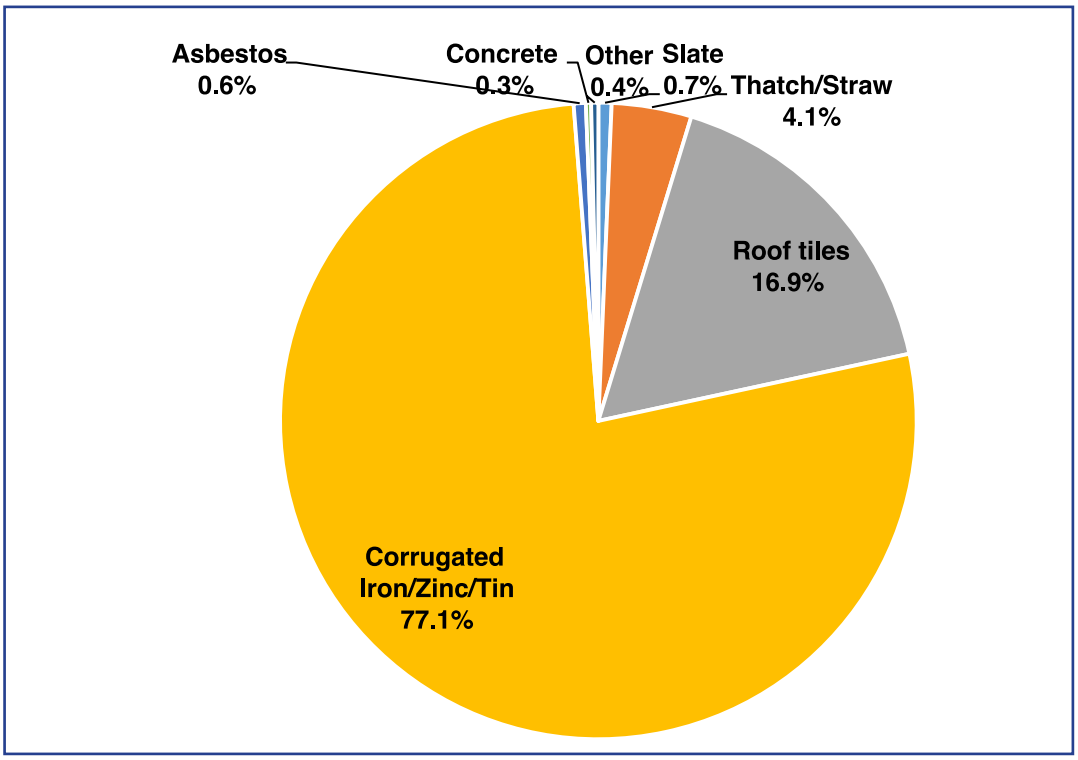
TABLE 3: Distribution of housing units by material for construction of walls

MATERIAL USED FOR WALLS	NUMBER OF HOUSING UNITS	PERCENTAGE NUMBER OF HOUSING UNITS
Conventional bricks/blocks	602,847	87.1
Mud bricks/blocks	40,923	5.9
Mud and poles/cow dung/thatch/reeds/bottles	18,027	2.6
Poles and reeds/straw	1,727	0.2
Corrugated Iron/Zinc/Tin	23,268	3.4
Asbestos	1,021	0.1
Wood	1,426	0.2
Stone	311	0.0
Other	2,264	0.3
Total	**691,814**	**100.0**

The results in **Figure 1** shows the distribution of roofing materials used in housing units across Botswana. The findings indicated that 77% of houses use corrugated iron/zinc/tin due to its affordability and durability. The Roof tiles are the second most used at 17%, because of their aesthetic and durable qualities. Thatch or straw, reflecting traditional practices, accounts for 4% of the roofs. Less common materials like slate, asbestos, and concrete each make up less than 1% of the total. The widespread use of modern materials suggests economic progress, while the minimal use of asbestos indicates a positive move towards safer options. This distribution reflects diverse economic conditions and cultural preferences within the population.

Table A6 in the appendix presents the distribution of floor materials in Botswana's housing units and reveals that cement was the predominant choice, utilized in 57.3% of homes, followed by floor tiles at 35.4%. Traditional materials like mud and mud/dung were used in 3.4% and 1.8% of homes, respectively, while wood, brick/stones, and other materials are minimally represented, each comprising less than 1% of the total.

FIGURE 1: Percentage distribution of housing units material for construction of roofs, 2022 Census



4.4. Construction material used on floors and the roof of the main house for the household from 1991 to 2022 census.

Table 4 shows a comparison of the material used for floors and roof over the censuses from 1991 to 2022. It must be noted that the construction material, cement, under floors in 1991 all through to 2011 included tiles and stone flooring and that floor tiles appear as a separate entity in the current census, as such a 57.3% use of cement in the 2022 census may not be a true reflection of the extent to which cement was used for flooring relative to the other censuses. We also note a 35.4% use of floor tiles in the 2022 census. Floor tiles includes but may not be limited to ceramic, porcelain and vinyl tyles. All other flooring material such as wood, brick and stone, and none have been categorised under 'other', and it shows an increase from 1.8% in the 2011 census to 3.1% in 2022.

The use of corrugated iron sheets for roofing is not as popular in 2022 at 77.1% as it were in the 2011 census at 86.4%. There is a 16.9% use of roof tiles for roofing in the current census. Despite its severe health warnings, 10.8% of the 13 219 housing units in Selebi Phikwe still use asbestos roofing, followed by Francistown at 2.3% out of 33 716 housing units.

Since thatched roofs draw some attraction with their rustic style and serene appearance, we find that 89.9% of the 189 housing units in the delta, a predominately tourist attraction area, are thatched, as compared to 87.8% out of the 82 housing units in the Central Kgalagadi game reserve, which may be a reflection of poverty and underdevelopment **(Appendix table A3)**The results also indicated that amongst those using Floor tiles 34.3% and 26.7% had their levels education being secondary school cert and degree holders. Generally those with primary and secondary school as their highest level of education predominantly cut across all the material type of flooring **(Appendix table A5).**

TABLE 4: Construction materials used for floors and roof from 1991 to 2022 census

CONSTRUCTION MATERIALS	1991	2001	2011	2021
FLOOR				
Cement	57.7	78.16	86.9	57.3
Floor tiles	-	-	-	35.4
Mud and mud and dung	35.9	18.01	10.4	4.2
Others	6.4	9.12	1.8	3.1
PERCENTAGE TOTAL	**100.0**	**100.0**	**100.0**	**100.0**
ROOF				
Corrugated iron sheets	49.6	68.88	86.4	77.1
Roof tiles	-	-	-	16.9
Concrete	-	-	-	0.3
Thatch	41.2	22	11.8	4.1
Others	9.2	9.12	1.8	1.6
PERCENTAGE TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

4.5. Tenure of housing unit by locality and gender.

Housing tenure is defined as a financial arrangement and ownership structure under which someone has the right to live in a house or an apartment. Several categories of the housing tenure as used in the 2022 census includes, owner occupied, family home, rented individual, rented from the institutions as listed in the table below amongst other things. In this section we consider the distribution of how the housing unit was acquired by the locality type. 58.4% of the housing units in rural areas are self-built compared to 9.6% and 32.9% in urban and urban villages respectively.

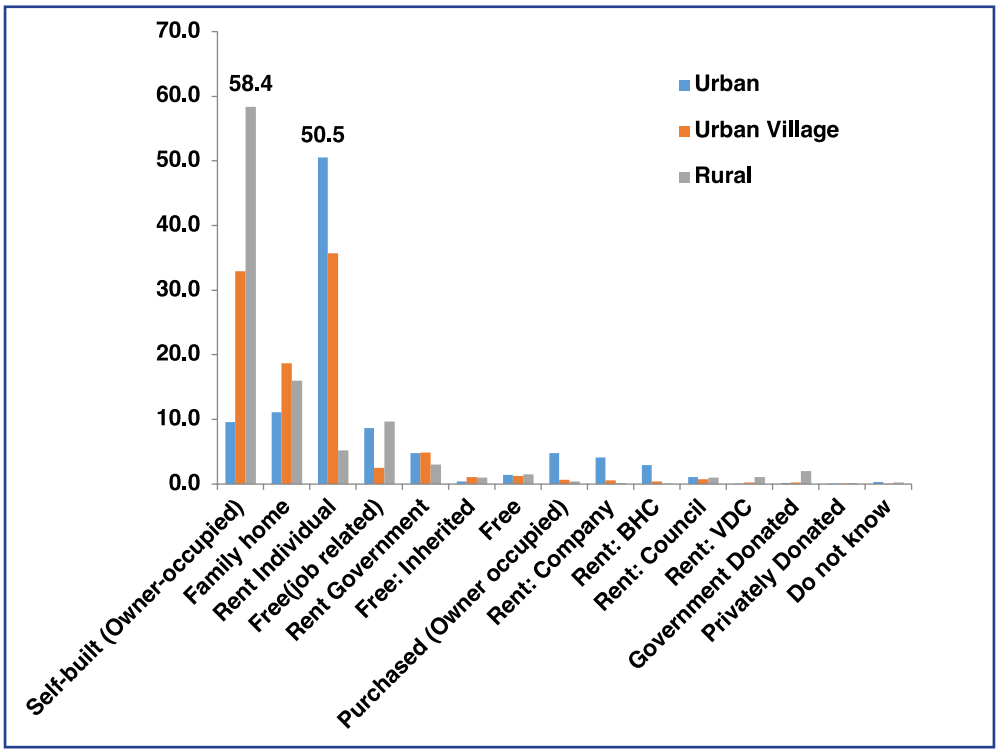
The results in **Table 5**, indicated that amongst those living in urban areas, 50.5% of them stay in individually rented houses, and an aggregate of 13.1% are housing units rented from institutions such as government, BHC etc. A visual impression of the housing unit tenure by locality is given in **figure 2.** We can conclude that, generally self-built, family homes and individually rented houses dominate the distribution of the housing tenure.

TABLE 5: Percentage of housing units by Housing Tenure and type of residence, 2022 Census

ACQUISITION OF HOUSING UNIT	URBAN	URBAN VILLAGE	RURAL	TOTAL
Self-built (Owner-occupied)	9.6	32.9	58.4	**36.6**
Family home	11.1	18.7	16.0	**16.1**
Rent Individual	50.5	35.7	5.2	**28.4**
Free(job related)	8.7	2.5	9.7	**6.3**
Rent Government	4.8	4.8	3.1	**4.2**
Free: Inherited	0.4	1.1	1.0	**0.9**
Free	1.4	1.2	1.5	**1.4**
Purchased (Owner occupied)	4.8	0.7	0.4	**1.5**
Rent: Company	4.1	0.6	0.2	**1.2**
Rent: BHC	3.0	0.4	0.1	**0.8**
Rent: Council	1.1	0.8	1.0	**0.9**
Rent: VDC	0.1	0.3	1.0	**0.5**
Government Donated	0.1	0.2	2.0	**0.8**
Privately Donated	0.0	0.1	0.2	**0.1**
Do not know	0.3	0.1	0.2	**0.2**
PERCENTAGE TOTAL	**100.0**	**100.0**	**100.0**	**100.0**

The analysis of housing data by gender reveals significant disparities in housing occupancy between males and females across various housing types in Botswana shown in **Table 6** and **Figure 3**. Traditional housing was predominantly occupied by males (57.8%) compared to females (42.2%), while mixed housing units have a higher percentage of female occupants (53.8%) than males (46.2%). Detached and semi-detached housing also show a slight male dominance, with 53.5% and 53.7% male occupants, respectively. Townhouses, terraced houses, and flats/apartments are more commonly occupied by males, with percentages of 60.1% and 58.5%, respectively.

FIGURE 2: Percentage of housing units by Housing Tenure and type of residence, 2022 Census

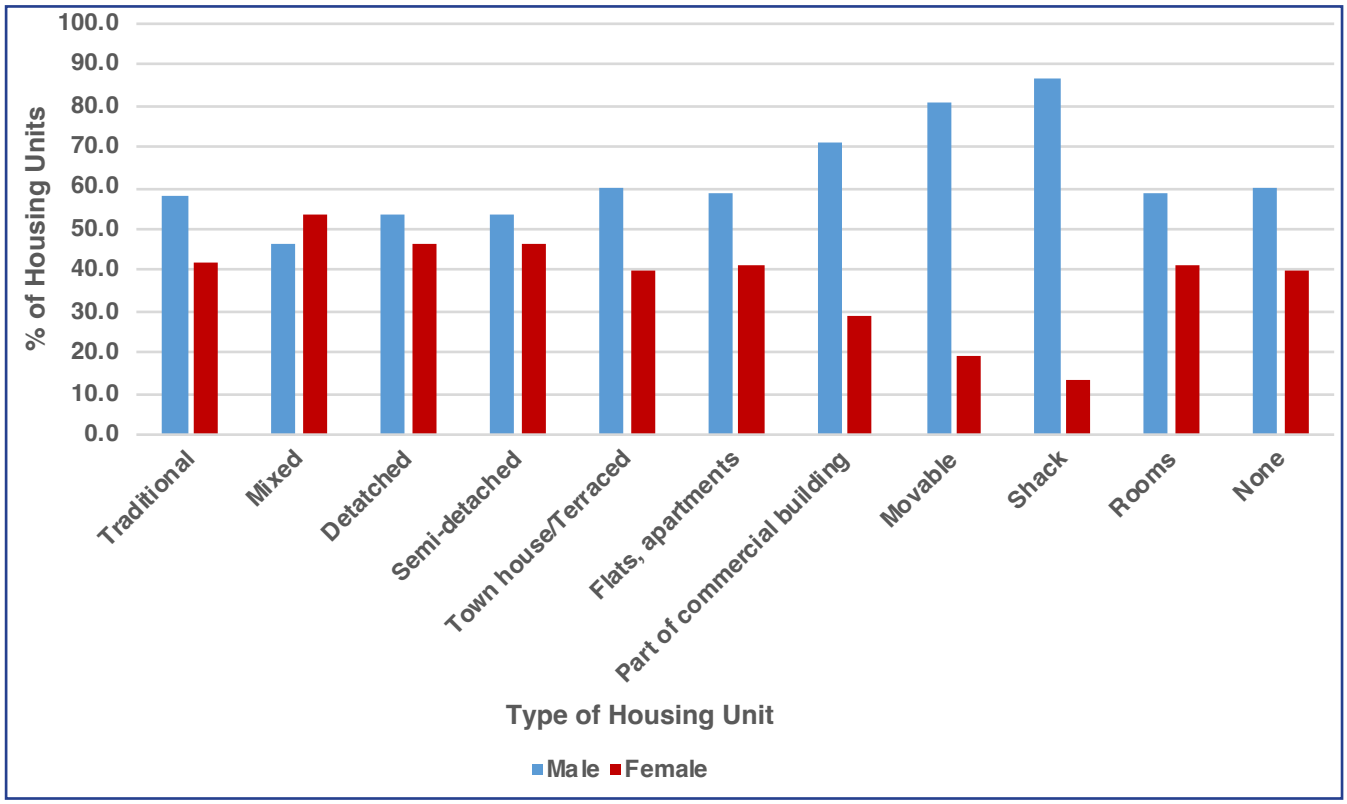


The findings highlights that males overwhelmingly occupy movable housing (80.7%) and shacks (86.5%). On the other hand, females have a more significant presence in rooms, representing 41.1% of occupants compared to 58.9% males. Overall, the total gender distribution across all housing types was 55% male and 45% female. These results underscore the need for gender-sensitive housing policies and targeted interventions to ensure equitable housing access and quality for both males and females in Botswana.

TABLE 6: Distribution of housing units by gender, 2022 Census

TYPE OF HOUSING UNIT	GENDER		PERCENTAGE TOTAL	NUMBER OF HOUSING UNITS
	MALE	FEMALE		
Traditional	57.8	42.2	100.0	39,312
Mixed	46.2	53.8	100.0	103,389
Detached	53.5	46.5	100.0	333,018
Semi- detached	53.7	46.3	100.0	28,152
Town house/Terraced	60.1	39.9	100.0	8,960
Flats,Apartment	58.5	41.5	100.0	13,182
Part of commercial building	71.2	28.8	100.0	125
Movable	80.7	19.3	100.0	1,197
Shack	86.5	13.5	100.0	19,275
Rooms	58.9	41.1	100.0	145,166
None	59.8	40.2	100.0	3,871
Total	**55.0**	**45.0**	**100.0**	**695,647**

FIGURE 3: Percentage distribution of Housing Units by Gender, 2022 Census



4.6. Distribution of amenities in the household, 2022 census

The analysis of housing amenities in Botswana reveals significant disparities between urban, urban village, and rural areas as shown in **Table 7** below. Urban areas have the highest percentage of flush toilets connected to sewer lines (85.4%), while rural areas have the least (7.7%). Rural households predominantly rely on pit latrines (47.4%), and a notable 28.1% lack any toilet facilities. Urban villages show a mix, with a considerable reliance on pit latrines (41.4%) and some use of septic tanks (18.9%). Regarding bathroom availability, urban areas again lead with 64.1% of households having a fixed bath or shower within the housing unit, compared to 20.1% in rural areas.

TABLE 7: Percentage distribution of amenities in the housing units by locality, 2022 Census

TOILET AVAILABILITY	URBAN	URBAN VILLAGE	RURAL	TOTAL
Flush toilet (connected to sewer line)	85.4	34.2	7.7	**36.2**
Flush toilet (with septic tank)	4.4	18.9	11.6	**13.3**
Ventilated Improved Pit Latrine (VIP)	0.9	2.5	2.4	**2.1**
Pit latrine	8.8	41.4	47.4	**36.4**
Dry Compost (e.g. Enviro loo)	0.0	0.3	2.8	**1.1**
None	0.4	2.7	28.1	**10.9**
PERCENT	**100.0**	**100.0**	**100.0**	**100.0**
BATHROOM AVAILABILITY				
fixed bath or shower within housing unit	64.1	46.8	20.1	**41.4**
without fixed bath or shower within housing unit	2.7	7.4	7.5	**6.4**
fixed bath or shower outside housing unit	1.7	1.7	1.5	**1.6**
without fixed bath or shower outside housing unit	0.4	1.7	3.5	**2.0**
No bathroom available	31.1	42.4	67.4	**48.5**
PERCENT	**100.0**	**100.0**	**100.0**	**100.0**
KITCHEN AVAILABILITY				
kitchen within housing unit	65.3	60.2	32.6	**51.8**
other space for cooking within housing unit	11.7	14.8	20.3	**16.0**
No, kitchen or other space for cooking outside housing unit	2.0	5.3	25.2	**11.4**
No kitchen or other space for cooking	21.0	19.7	21.9	**20.7**
PERCENT	**100.0**	**100.0**	**100.0**	**100.0**

The results also reveals that 67.4% of rural households have no bathroom facilities, highlighting a critical need for infrastructure improvement. In terms of kitchen facilities, 65.3% of urban households have a kitchen within the housing unit, whereas only 32.6% of rural households do. Rural areas also show a higher percentage of households with no kitchen or other space for cooking (25.2%). These findings underscore the necessity for targeted interventions to improve sanitation, bathroom, and kitchen facilities in rural areas, while continuing to enhance infrastructure in urban and urban village settings to ensure equitable access to essential amenities.

5. Conclusion and policy recommendations

The 2022 Population and Housing Census data has provided invaluable insights into the housing conditions and the intricate relationships with socioeconomic and demographic factors in Botswana. By addressing the housing needs of various population groups, especially the vulnerable and marginalized, and promoting sustainable and affordable housing practices, Botswana can make substantial progress towards enhancing the quality of life for all its citizens. The study further appreciates that despite having not ratified housing as a human right, the Government of Botswana upholds shelter as a basic need and as such facilitates for its provision. However, this is not sufficient and much still need to be done in terms of the legal and institutional framework to ensure that the delivery of housing (adequate) is well coordinated if the nation is to achieve the aspiration of adequate and decent housing for all by 2036.

The information collected on housing conditions during the 2022 Population and Housing Census is crucial for monitoring and evaluating the implementation of government policies and programs related to housing and land tenure. Based on the findings, the following policy recommendations and interventions are proposed:

1. **Investment in Affordable Housing:** Promote Public-Private Partnerships (PPPs) and increase investment in affordable housing projects to meet the growing housing demand. The government should focus on providing housing options for low and middle-income households.
2. **Improve Access to Housing Finance:** Develop policies to support mortgage lending and provide subsidies for housing construction. This will help households access housing finance, aiding the government's goal of ensuring decent housing for all by 2036.
3. **Prioritize Sustainable and Affordable Housing Delivery:** Ensure the delivery of sustainable and affordable housing with provisions for basic services and amenities like safe drinking water and sanitation. This is crucial to meet the current and future housing demand.
4. **Promote Sustainable Housing Practices:** Implement policies that encourage energy-efficient housing, green building practices, and the use of alternative building materials. This will help ensure the housing stock can meet future demands.
5. **Alignment of Key Institutions in the delivery of housing:** It is imperative for Government to consider re-aligning the institutions that are key in the delivery of housing. This will ensure that there is proper coordination in terms of policy development and policy implementation. For instance, it will be appropriate for government to set up a ministry or department that is mandated with issues of human settlements, housing and urbanization.
6. **Enshrine Housing as a Constitutional Right:** Consider amending the constitution to recognize housing as a human right, aligning with United Nations' declarations. This would ensure every resident of Botswana has access to decent and affordable housing, whether owned or rented.

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APPENDIX

TABLE A1: Wall material use by district

DISTRICT	CONVENTIONAL BRICKS/BLOCKS	MUD BRICKS/ BLOCKS	MUD AND POLES/ COW DUNG/ THATCH/REEDS/ BOTTLES	POLES AND REEDS/STRAW	CORRUGATED IRON/ZINC/TIN	ASBESTOS	WOOD	STONE	OTHER	TOTAL HOUSING UNITS
Gaborone	96.7	2.2	0.0	0.0	0.9	0.1	0.0	0.0	0.2	**81,723**
Francistown	94.7	4.5	0.0	0.0	0.5	0.1	0.0	0.0	0.2	**33,716**
Lobatse	95.9	2.3	0.0	0.0	0.5	0.3	0.0	0.0	0.9	**9,797**
Selibe Phikwe	97.9	0.9	0.2	0.0	0.4	0.2	0.0	0.0	0.5	**13,219**
Orapa	96.3	0.1	0.1	0.0	0.9	0.8	0.1	0.0	1.8	**3,036**
Jwaneng	97.0	0.3	0.0	0.0	1.8	0.7	0.0	0.0	0.1	**6,565**
Sowa	99.4	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	**1,100**
Southern	86.9	5.2	1.2	0.1	6.1	0.1	0.1	0.0	0.2	**37,509**
Barolong	88.1	4.1	1.6	0.0	5.5	0.0	0.2	0.1	0.3	**16,382**
Ngwaketse West	64.5	7.7	6.6	0.7	18.3	0.7	0.5	0.0	1.0	**6,537**
South East	95.2	2.6	0.4	0.0	1.4	0.1	0.1	0.1	0.1	**35,900**
Kweneng East	92.7	3.9	0.6	0.1	2.2	0.2	0.1	0.0	0.1	**100,490**
Kweneng West	63.5	9.3	6.2	1.2	16.1	0.4	2.4	0.3	0.5	**15,765**
Kgatleng (Wards)	90.2	4.0	0.4	0.1	5.0	0.1	0.2	0.0	0.1	**36,123**
Central Serowe -Palapye	83.8	8.3	2.1	0.1	4.9	0.1	0.2	0.0	0.5	**56,512**
Central Mahalapye	84.3	8.5	2.0	0.1	4.7	0.1	0.1	0.0	0.2	**36,409**
Central Bobonong	83.9	11.3	2.3	0.1	1.8	0.1	0.1	0.1	0.3	**21,972**
Central Boteti	74.8	13.4	6.4	0.6	3.9	0.1	0.3	0.1	0.4	**21,018**
Central Tutume	82.8	11.2	3.7	0.1	1.7	0.0	0.1	0.0	0.2	**46,192**
North East	94.2	3.9	0.3	0.0	1.4	0.0	0.0	0.0	0.1	**20,707**
Ngamiland East	80.7	8.6	6.4	0.3	2.8	0.1	0.3	0.1	0.8	**31,153**
Ngamiland West	58.5	13.3	21.4	4.3	1.4	0.1	0.3	0.0	0.7	**17,676**
Chobe	87.0	4.3	1.8	0.4	3.2	1.1	1.0	0.0	1.2	**9,992**
Delta	2.6	31.2	57.7	4.8	1.6	1.1	0.5	0.0	0.5	**189**
Ghanzi	68.6	6.2	12.5	0.2	10.0	0.4	0.4	0.2	1.3	**15,250**
CKGR	11.0	0.0	87.8	0.0	0.0	0.0	0.0	0.0	1.2	**82**
Kgalagadi South	78.5	6.2	8.9	0.2	5.0	0.2	0.1	0.1	0.7	**9,691**
Kgalagadi North	82.5	2.9	7.1	0.1	6.2	0.1	0.4	0.0	0.6	**7,109**
TOTAL	**87.1**	**5.9**	**2.6**	**0.2**	**3.4**	**0.1**	**0.2**	**0.0**	**0.3**	691,814

TABLE A2: Floor material use by district

DISTRICT	CEMENT	FLOOR TILES	MUD	MUD/ DUNG	WOOD	BRICK/ STONES	NONE	OTHER	TOTAL
Gaborone	39.6	59.9	0.1	0.0	0.1	0.1	0.1	0.2	**81,723**
Francistown	58.0	41.6	0.1	0.1	0.0	0.0	0.1	0.1	**33,716**
Lobatse	66.6	33.2	0.1	0.0	0.0	0.0	0.1	0.1	**9,797**
Selibe Phikwe	64.2	35.3	0.1	0.1	0.1	0.1	0.1	0.0	**13,219**
Orapa	2.2	95.8	0.0	0.0	0.5	0.0	0.0	1.4	**3,036**
Jwaneng	29.0	70.1	0.1	0.0	0.0	0.0	0.4	0.2	**6,565**
Sowa	67.1	32.8	0.0	0.0	0.1	0.0	0.0	0.0	**1,100**
Southern	64.1	29.0	2.7	1.8	0.1	0.1	2.0	0.3	**37,507**
Barolong	68.6	25.9	1.7	1.4	0.1	0.2	1.7	0.4	**16,382**
Ngwaketse West	62.6	14.7	8.2	3.2	0.3	0.3	9.0	1.7	**6,537**
South East	47.6	51.1	0.4	0.3	0.1	0.1	0.2	0.1	**35,900**
Kweneng East	59.7	36.9	1.5	0.9	0.1	0.1	0.6	0.1	**100,486**
Kweneng West	60.2	14.4	8.6	4.6	0.6	0.3	10.5	0.7	**15,764**
Kgatleng (Wards)	59.0	37.5	1.3	0.5	0.1	0.1	1.4	0.1	**36,123**
Central Serowe -Palapye	61.0	28.7	5.7	2.9	0.1	0.1	1.1	0.3	**56,511**
Central Mahalapye	67.3	23.0	5.8	2.3	0.1	0.1	1.4	0.2	**36,409**
Central Bobonong	66.3	24.1	5.3	3.8	0.1	0.0	0.3	0.2	**21,972**
Central Boteti	55.8	26.2	8.6	5.8	0.1	0.1	2.9	0.5	**21,017**
Central Tutume	63.5	25.2	7.1	3.3	0.1	0.1	0.5	0.1	**46,191**
North East	62.2	35.8	1.3	0.3	0.0	0.1	0.1	0.1	**20,707**
Ngamiland East	55.7	31.1	5.9	4.1	0.2	0.1	2.1	0.8	**31,152**
Ngamiland West	55.5	14.5	16.3	7.6	0.2	0.1	5.1	0.6	**17,676**
Chobe	63.1	30.4	1.6	1.1	0.9	0.2	2.0	0.7	**9,992**
Delta	5.8	0.0	51.3	39.2	1.1	0.5	2.1	0.0	**189**
Ghanzi	54.4	28.0	3.5	2.4	0.1	0.3	10.1	1.2	**15,247**
CKGR	0.0	11.0	0.0	0.0	1.2	0.0	50.0	37.8	**82**
Kgalagadi South	63.4	25.3	3.0	2.4	0.1	0.2	4.7	0.9	**9,691**
Kgalagadi North	60.2	28.3	2.2	2.0	0.3	0.1	5.9	1.0	**7,108**
TOTAL	57.3	35.4	3.4	1.8	0.1	0.1	1.6	0.3	**691,799**

TABLE A3: Roofing material by district

DISTRICT	SLATE	THATCH/ STRAW	ROOF TILES	CORRUGATED IRON/ZINC/TIN	ASBESTOS	CONCRETE	OTHER	TOTAL
Gaborone	0.9	0.3	38.2	58.2	0.9	1.0	0.6	**81,722**
Francistown	0.9	0.2	19.7	76.7	2.3	0.2	0.1	**33,716**
Lobatse	1.0	0.0	16.2	80.1	2.0	0.3	0.3	**9,797**
Selibe Phikwe	0.3	0.1	13.0	75.7	10.8	0.2	0.0	**13,219**
Orapa	0.0	0.0	26.5	68.1	3.7	1.5	0.1	**3,036**
Jwaneng	0.3	0.1	30.2	67.8	1.5	0.1	0.1	**6,565**
Sowa	0.2	0.0	12.3	87.5	0.1	0.0	0.0	**1,100**
Southern	0.5	2.6	14.8	81.4	0.4	0.1	0.2	**37,507**
Barolong	0.5	2.5	11.2	85.4	0.0	0.0	0.3	**16,382**
Ngwaketse West	2.0	6.3	4.2	86.5	0.1	0.0	0.8	**6,537**
South East	1.2	1.0	27.9	69.5	0.1	0.3	0.1	**35,900**
Kweneng East	0.7	2.6	16.5	79.6	0.1	0.2	0.2	**100,481**
Kweneng West	0.8	15.2	5.1	78.1	0.1	0.1	0.6	**15,762**
Kgatleng (Wards)	0.9	0.5	18.3	79.9	0.1	0.2	0.1	**36,123**
Central Serowe -Palapye	0.5	5.5	14.6	78.9	0.1	0.1	0.3	**56,510**
Central Mahalapye	0.3	5.9	12.3	80.8	0.2	0.1	0.3	**36,409**
Central Bobonong	0.2	3.5	12.2	83.6	0.3	0.1	0.2	**21,972**
Central Boteti	0.9	9.0	8.2	81.0	0.1	0.1	0.6	**21,016**
Central Tutume	0.4	9.1	11.1	79.0	0.1	0.2	0.2	**46,190**
North East	0.2	1.5	15.6	82.5	0.1	0.0	0.1	**20,707**
Ngamiland East	0.9	3.9	6.9	87.0	0.4	0.3	0.6	**31,149**
Ngamiland West	0.3	30.6	1.9	65.6	0.1	0.2	1.4	**17,676**
Chobe	2.2	2.2	5.7	88.1	1.0	0.1	0.8	**9,992**
Delta	0.0	89.9	0.0	8.5	1.1	0.0	0.5	**189**
Ghanzi	0.2	3.2	7.1	87.5	0.1	0.1	1.8	**15,247**
CKGR	0.0	87.8	9.8	1.2	0.0	0.0	1.2	**82**
Kgalagadi South	0.3	2.2	6.6	89.5	0.7	0.0	0.6	**9,691**
Kgalagadi North	0.2	2.3	11.2	85.6	0.2	0.0	0.6	**7,108**
TOTAL	**0.7**	**4.1**	**16.9**	**77.1**	**0.6**	**0.3**	**0.4**	**691,785**

TABLE A4: Distribution of housing units by material for construction of walls by educational attainment

EDUCATION	CONVENTIONAL BRICKS/BLOCKS	MUD BRICKS/ BLOCKS	MUD AND POLES/ COW DUNG/ THATCH/REEDS/ BOTTLES	POLES AND REEDS/STRAW	CORRUGATED IRON/ZINC/TIN	ASBESTOS	WOOD	STONE	OTHER	TOTAL
Preschool	0.1	0.4	0.5	0.2	0.5	0.1	1.2	-	0.4	**0.2**
Primary	19.4	34.8	43.4	43.8	37.3	16.6	33	26	24.6	**21.2**
Secondary	46.8	48.9	50	45.7	52	47.3	49	53.1	49.9	**47.2**
Non Formal	1.4	2	2.2	3.4	1.8	0.8	1.2	1.9	1.6	**1.5**
Certificate	6.4	3.5	2.1	2.9	2.7	10	5.8	5.4	5	**6.1**
Diploma	11.5	4.5	0.9	2.2	2.9	14.4	5	5.4	8.2	**10.7**
Degrees	14.3	5.8	0.9	1.7	2.9	10.6	4.8	8.1	10.1	**13.3**
Not Stated	0	0	-	-	0	-	0.1	-	-	**0**
PERCENTAGE TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
NUMBER OF HOUSEHOLD UNITS	**337,247**	**30,277**	**11,719**	**997**	**17,238**	**949**	**989**	**258**	**1,834**	**604,254**

TABLE A5: Distribution of housing units by material for construction of floor by educational attainment

EDUCATION	CEMENT	FLOOR TILES	MUD	MUD/ DUNG	WOOD	BRICKS/ STONES	NONE	OTHER	TOTAL
Preschool	0.2	0.1	0.6	0.5	0.1	0.5	0.7	0.3	**0.2**
Primary	25.7	11.4	46.9	47.1	18.5	25.5	44.7	30.7	**21.2**
Secondary	56.7	34.3	46.8	47.1	45.4	48.8	48.3	50.3	**47.2**
Non Formal	1.8	0.8	2.5	2.3	0.9	1.9	2.4	1.5	**1.5**
Certificate	5.5	7.4	1.6	1.3	7.0	7.2	2.1	4.4	**6.1**
Diploma	5.5	19.3	0.9	0.9	8.9	5.8	0.9	6.0	**10.7**
Degrees	5.1	26.7	0.8	0.8	19.2	9.9	0.9	6.8	**13.3**
Not Stated	0	0	0	0	0	0.3	0	0	**0**
PERCENTAGE TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
NUMBER OF HOUSEHOLD UNITS	**337,247**	**234,324**	**14,812**	**7,907**	**812**	**635**	**6,965**	**1,544**	**604,246**

TABLE A6: Distribution of housing units by material for construction of floor

FLOOR MATERIAL	FREQUENCY	PERCENT
Cement	396,542	57.3
Floor Tiles	244,614	35.4
Mud	23,233	3.4
Mud/dung	127,91	1.8
Wood	933	0.1
Brick/Stones	762	0.1
None	10,892	1.6
Other	2,032	0.3
TOTAL	**691,799**	**100.0**

PROFILES OF DISTRICTS AND HOUSEHOLD CHARACTERISTICS FROM BOTSWANA CENSUS 2022

Alphonse Amey, Masego Otlaadisa and Fastel Chipepa

EXECUTIVE SUMMARY

The research seeks to address the profiles and characteristics of the households in Botswana based on the 2022 census results. The analysis seeks to establish the progress towards achieving selected aims of the SDGs and Vision 2036. The paper studies the population structure and computes some demographic indicators for the 10 districts. It also addresses school attendance for children between the ages of 6 and 14, access to basic services such as clean water, energy, sanitation and internet availability and the use of ICT resources. The proportion of households with access to residential, agricultural, and business land is also investigated. The analysis of the population structure shows marked deficits for the 15-19 age group in Chobe, Kweneng, Ghanzi, and Kgatleng. It also shows in the 20-24 age group in Kgalagadi, Northwest, Central, and Northeast and in the 25-29 and 30-35 year groups in the Central and Southern districts. Dependency ratios vary from 37.0 in South East to 72.4 in the Central District. School attendance by children 6-15 years was above 90 percent in all districts except for Ghanzi district where it was 89 percent. Disparities among the districts were also observed in access to basic services, with the South East district leading in most categories. Access to electricity (both on grid and off grid) range from 65.8 percent in Ghanzi to 93.3 percent in South East district. The most popular energy for cooking in Chobe district was electricity. In the Central, Ghanzi, Kgalagadi, North West and Southern districts, firewood was the most popular energy source for cooking. In the other districts, LPG and biogas was preferred. Overall, 10.9 percent of households do not have access to toilets. Land ownership range from 41 percent of households in South East district to 68 percent in Kgalagadi. Of households that own land, over 92 percent of them were residential plots in all districts. Internet connections in households were below 50 percent in all districts except for South East District with 60.2 percent and Chobe District with 56.4 percent. Mobile phone use was very widespread, above 85 percent in all districts.

1. INTRODUCTION AND OBJECTIVES

The purpose of this paper is to report on the selected demographic profiles and to provide an analysis of the status of districts in Botswana concerning their progress towards achieving selected objectives outlined in the domesticated Sustainable Development Goals (SDGs) and Vision 2036. By examining district profiles and household characteristics from the Botswana Census 2022, this report aims to evaluate how far we are from realizing some of these key development goals and objectives.

Botswana has committed to the global agenda of the SDGs, adapting them to the national context to address local challenges and priorities. The domesticated SDGs include goals such as eradicating poverty, ending hunger, ensuring good health and well-being, providing quality education, achieving gender equality, ensuring access to clean water and sanitation, and promoting affordable and clean energy. Additionally, the goals focus on fostering decent work and economic growth, building resilient infrastructure, reducing inequalities, making cities and communities sustainable, taking climate action, and promoting peace, justice, and strong institutions.

Complementing the SDGs, Vision 2036 outlines Botswana's aspirations for sustainable economic development, human and social development, a sustainable environment, and good governance, peace, and security. Vision 2036 aims to diversify the economy, enhance the quality of life, protect the environment, and ensure good governance and social cohesion.

Sustainable economic development is addressed by Pillar 1 of Vision 2036. Effective economic activity in the 21st century requires adequate ICT resources and the ability of the population to use such resources. Pillar 2 of Vision 2036 addresses human and social development. Education, skills development, welfare of the youth and children fall under this pillar. Pillar 3 addresses sustainable environment under which we have water and energy security, environmentally safe management of waste and sustainable land use.

This paper therefore seeks to assess at the district level, the extent to which households and individuals have progressed towards achieving selected objectives of the SDGs and Vision 2036. Access to education, basic services such as clean water, energy and sanitation are examined using the census 2022 data. We also assess access to land, internet availability and the use of ICT resources by households.

Objectives

This paper seeks to

- **Study the age structure of the population and other demographic characteristics of each district.**
- **Evaluate the rate of school attendance by children aged 6 – 15 years.**
- **Describe the characteristics of household heads – age, marital status, employment status.**
- **Evaluate access to household services - energy sources, water, sanitation and refuse disposal.**
- **Assess household land ownership.**
- **Evaluate availability and use of ICT resources.**

This report will serve as a basis for decision-making in the districts concerning setting priorities, resource allocation, and action plans. By evaluating district-specific data, the report will highlight the progress made towards the domesticated SDGs and Vision 2036, identify areas where efforts need to be intensified, and provide insights into the socio-economic dynamics at the district level. Through this analysis, we aim to support policymakers, planners, and stakeholders in making informed decisions to accelerate development and achieve national and global goals.

2. LITERATURE REVIEW

Understanding the progress of districts towards achieving national and international development goals requires analysis of various socio-economic indicators. Previous reports on the status of Botswana have provided valuable insights into the nation's development trajectory, highlighting achievements, and identifying areas that need further attention. This section reviews relevant literature and standard indices that are commonly used to assess the socio-economic status and progress of a region.

2.1 Previous Reports on Botswana's Progress

Several reports have been published to assess Botswana's progress towards achieving the Sustainable Development Goals (SDGs) and the targets outlined in Vision 2036. Notable among these are the Botswana Demographic Survey, the Botswana Multi-Topic Household Survey, and annual progress reports on the National Development Plan. These reports provide a wealth of data on population dynamics, economic conditions, education, health, and other critical areas of development.

Botswana Demographic Survey (BDS)

The BDS provides detailed demographic data, including population size, growth rates, and distribution across districts. It also includes analyses of fertility rates, mortality rates, and migration patterns.

Botswana Multi-Topic Household Survey (BMTHS)

The BMTHS collects data on household characteristics, income, expenditure, employment, education, and health. It offers insights into living conditions and socio-economic disparities across different regions.

National Development Plan (NDP) Progress Reports

The NDP progress reports monitor the implementation of development projects and policies. They evaluate the country's advancement towards achieving the objectives of Vision 2036 and the domesticated SDGs.

2.2 STANDARD INDICES AND THEIR USES

To provide a comprehensive analysis of the districts' progress, several standard indices are employed. These indices help to quantify and compare various aspects of socio-economic development across regions.

Population Pyramids and Dependency Ratio

Population Pyramids: These graphical representations show the age and gender distribution of the population. They are crucial for understanding the demographic structure and identifying trends such as aging populations or youth bulges.

Dependency Ratio: This index measures the proportion of dependents (children aged 0-14 and elderly aged 65+) to the working-age population (15-64 years). A high dependency ratio indicates a greater burden on the productive population to support dependents, which can impact economic growth and resource allocation.

Proportion of School-Going Age Children in School

This index measures the percentage of children of school-going age who are enrolled in educational institutions. It is a critical indicator of access to education and the effectiveness of the educational system. Conversely, the proportion of out-of-school children highlights gaps in education access and can inform targeted interventions.

2.3 ANALYSIS OF PREVIOUS FINDINGS

Previous reports and surveys have revealed several critical trends and challenges in Botswana's development journey:

Population Dynamics

According to the Botswana Demographic Survey 2019, Botswana's demographic profile is characterized by a substantial youthful population and a high dependency ratio, along with an emerging trend of an increasing elderly population. Specifically, approximately 33 percent of the population is under the age of 15, indicating a significant youthful population. The median age of Botswana's population is around 25 years, which is relatively low and indicative of a youthful population structure.

The dependency ratio, calculated as the ratio of dependents (people younger than 15 or older than 64) to the working-age population (ages 15-64, comprising 62 percent of the total population), is approximately 57.3 percent according to the 2019 survey.

Additionally, the proportion of the population aged 65 and above has been gradually increasing. In the 2011 census, this age group constituted about 4.5 percent of the total population, while in 2021, this proportion increased to around 5.6 percent, reflecting an aging trend. Life expectancy in Botswana has been improving, rising from 54 years in 2001 to approximately 69 years in 2020. This improvement in life expectancy contributes to the growing elderly population.

This demographic transition suggests that while the country currently faces the challenges of supporting a large number of dependents, it also needs to prepare for the implications of an aging population in the coming decades.

Education

According to the Botswana Education Statistics Report 2015, the proportion of school-going-age children in school has improved over the years, reflecting successful educational policies. However, disparities in education access and quality persist between urban and rural areas.

The Net Enrollment Ratio (NER) for primary education stood at 93 percent, showing that 93 percent of children of official primary school age are enrolled in primary school. This is an improvement from previous years where the NER was lower (2009: 85.8 percent, 2010: 89.4 percent, 2011: 89.7 percent), reflecting successful educational policies aimed at increasing access to education. For secondary education, the NER has also improved, reaching around 73 percent in 2012, indicating that 73 percent of children of official secondary school age are enrolled in secondary school, up from previous years.

According to the Botswana Multi-Topic Household Survey (BMTHS) 2020, there are notable differences in enrollment rates between urban and rural areas. In primary school enrollment, 95 percent of primary school-age children were enrolled in urban schools, while 85 percent of primary school-age children were enrolled in rural schools. Conversely, in secondary school enrollment, 75 percent of secondary school-age children were enrolled in urban schools, while 60 percent of secondary school-age children were enrolled in rural schools.

The literature review highlights the importance of utilizing standard indices to monitor and evaluate the socio-economic progress of districts. Therefore, by analyzing population pyramids, dependency ratios, and education enrollment rates, we can gain an understanding of the current status and identify areas for improvement. This report builds on previous findings to provide updated and detailed profiles of districts, offering a valuable tool for decision-making and policy formulation aimed at achieving the SDGs and Vision 2036.

3. DATA AND METHODOLOGY

Data

The data for this paper are provided by Statistics Botswana from the Census 2022 dataset. The data obtained from Statistics Botswana had both the individual level and household level information for selected variables. The Census data were organized by the census districts, which were collapsed into the 10 administrative districts as follows:

Administrative District	Census District
Central	Central Serowe -Palapye, Central Tutume, Central Mahalapye, Central Bobonong, Central Boteti, Selibe Phikwe, Orapa, Sowa
Chobe	Chobe
Ghanzi	Ghanzi, CKGR
Kgalagadi	Kgalagadi South, Kgalagadi North
Kgatleng	Kgatleng (Wards)
Kweneng	Kweneng East, Kweneng West
North-East	Francistown, North East
North-West	Ngamiland East, Ngamiland West, Delta
South-East	Gaborone, South East, Lobatse
Southern	Southern, Barolong, Jwaneng, Ngwaketse West

Tools

Population pyramids were constructed using excel. Computations and cross-tabulations were done using SPSS.

Methodology

From the individual level data, we compute for each district.

1. Demographic Indicators

- **Population pyramids: Constructed to visualize the age and gender distribution across districts.**
- **Dependency Ratio (DR)** $DR = \frac{\text{(Population under 15 years of age+population aged 65 and over)}}{\text{/(population aged from 15 to 64)}}$

- **Sex ratio (SR)** $SR = 100 \times \frac{\text{(Number of males)}}{\text{/(Number of females)}}$

- **Average household size (AHS)** $AHS = \frac{\text{(population size)/}}{\text{(number of households).}}$

2. School attendance

- The number of children in school was defined as the total number of children aged 6-15 who were currently in school or had completed school.
- The number of children not in included those who had never attended or had discontinued school.

3. Household Characteristics:

- Analysis included age, gender distribution, marital status, education status, and employment status of household heads.
- Cross-tabulations were performed to examine these variables across different administrative districts.

4. Access to Household Services:

- Energy Sources: Assessed the primary sources of energy for lighting and cooking, with specific focus on electricity, gas, and firewood usage.
- Water and Sanitation: Evaluated access to piped water and toilet facilities.
- Refuse Disposal: Analyzed methods of waste disposal, including regular collection, burning, burying, and dumping.

5. ICT Resources:

- Evaluated the availability and use of ICT resources, including internet connections, mobile phone usage, and computer usage in households.

6. Land Ownership:

- Assessed the extent of land ownership among households, focusing on residential, agricultural, and business land ownership.

4. RESULTS AND DISCUSSION

4.1 Demographic Profiles

4.1.1 Household size, age structure, and characteristics of household heads.

The total population in Census 2022 is 2,359,609 in 695,703 households. This shows an increase in population size of 16.5 percent from Census 2011 when the population size was 2,024,904. The corresponding increase in the number of households is 26.3 percent from the 550,926 households Census 2011. The average household size in Census 2022 is 3.39, a decline from the Census 2011 figure of 3.7. Chobe district, with the smallest proportion of the national population, has the smallest average household size of 2.86 and Southern district has the highest average size of 4.01.

TABLE 1: Population Size, Households by District

	MALE POPULATION	FEMALE POPULATION	TOTAL POPULATION	PERCENTAGE OF NATIONAL POPULATION	NUMBER OF HOUSEHOLDS	AVERAGE HOUSEHOLD SIZE
Central	342,281	363,848	706,129	29.9	200,421	3.52
Chobe	14,623	14,119	28,742	1.2	10,062	2.86
Ghanzi	29,288	27,277	56,565	2.4	15,514	3.65
Kgalagadi	29,505	29,353	58,858	2.5	16,840	3.50
Kgatleng	60,240	61,633	121,873	5.2	36,377	3.35
Kweneng	190,543	197,440	387,983	16.4	116,870	3.32
North-East	82,381	90,388	172,769	7.3	54,738	3.16
North-West	97,409	101,027	198,436	8.4	49,496	4.01
South-East	186,429	201,117	387,546	16.4	128,175	3.02
Southern	117,916	122,792	240,708	10.2	67,210	3.58
Total	**1,150,615**	**1,208,994**	**2,359,609**	**100**	**695,703**	**3.39**

The data shows that there are more males than females in Chobe, Ghanzi and Kgalagadi districts. The sex ratios (number of males per 100 females) are Central – 94.1, Chobe – 103.6, Ghanzi – 107.4, Kgalagadi – 100.5, Kgatleng – 97.7, Kweneng – 96.5, North East – 91.1, North West – 96.4, South East – 92.7 and Southern - 96.0.

Figure 1 shows the age structure of the districts as population pyramids. There is a marked deficit in the 15-29 year-group in several districts. This is particularly pronounced in the 15–19-year group in Chobe, Kweneng, Ghanzi, and Kgatleng. It is also emphasized in the 20–24-year group in Kgalagadi, Northwest, Central, and Northeast. Other districts show this pattern to include those in the 25-29 and 30-35 year group, for example in the Central and Southern districts. The marked deficit is not sex sensitive as both males and females displays the same pattern. It is likely that both males and females in these age groups show a tendency to migrate to a different location, rather than a marked mortality experience. Only the South-East displays a marked difference in the relative sizes of the age groups. While its bottom age groups display a near even relative size, overshadowed by the 20-39 age groups of both sexes, the other regions have nearly a true pyramidal shape (with the observed irregularities).

A marked difference in the mortality experience of males and females is shown in the 80+ year groups. In general, the lower relative sizes of the 80+ conform to patterns known worldwide. It is marked by smaller proportions of males to females.

The dependency ratios computed from the census data show that the dependency ratio for Botswana is 58.7, a reduction from Census 2011, when the ratio was 60.2. The lowest ratio for the districts was South East with 37 and the highest was the Central District with 72.4. Values for the districts are: Central - 72.4, Chobe - 46.6, Ghanzi - 56.3, Kgalagadi - 62.3, Kgatleng - 54.4, Kweneng - 53.9, North East - 57.4, North West - 68.0, South East - 37.0, Southern - 68.4.

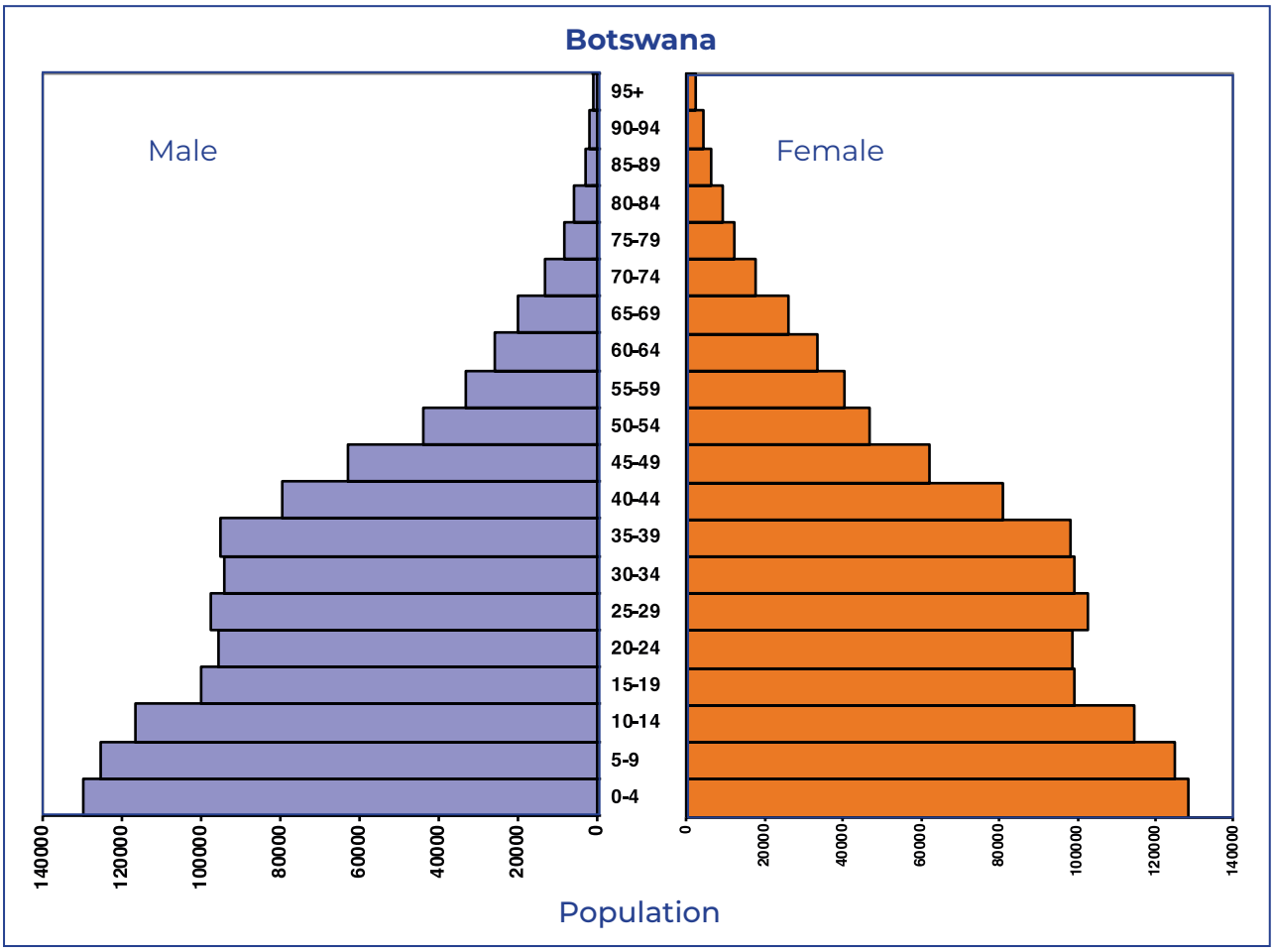
The median age of household heads **(see Table 2)** ranges from 39 years in Chobe district to 47 years in Southern district. The national median is 43 years. A few households are headed by children under the age of 18 years. Nationally, 3,421 out of 695,703 households (0.49 percent of all households) are headed by children. Of these, 1,115 are from the Central District which has 200,241 households.

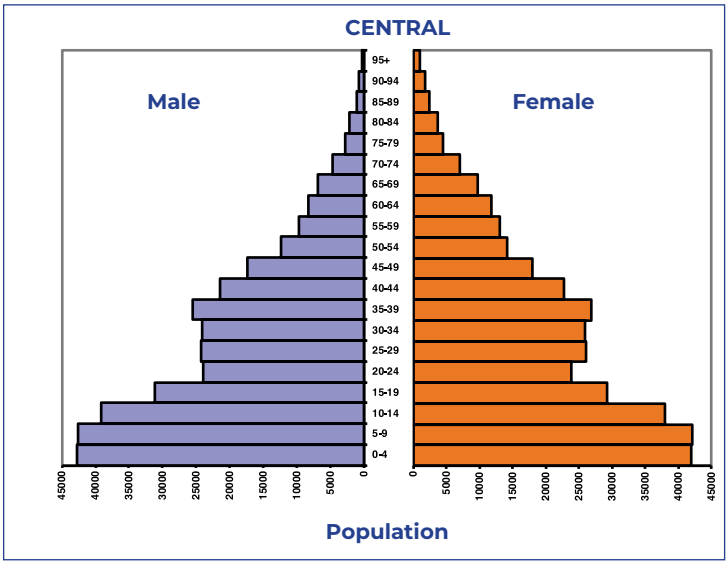
TABLE 2: Age distribution of household heads

	UNDER 18 YEARS (PERCENT)	18-64 YEARS (PERCENT)	65 YEARS AND ABOVE (PERCENT)	TOTAL	MEDIAN AGE
Central	1,111 (0.55)	163,175 (81.4)	36,135 (18.0)	**200,421**	46
Chobe	50 (0.50)	9,369 (93.1)	643 (6.4)	**10,062**	39
Ghanzi	108 (0.70)	13,997 (90.2)	1,409 (9.1)	**15,514**	41
Kgalagadi	85 (0.50)	14,353 (85.2)	2,402 (14.3)	**1,684**	44
Kgatleng	114 (0.31)	30,105 (82.8)	6,158 (16.9)	**36,377**	45
Kweneng	609 (0.52)	101,186 (86.6)	15,075 (12.9)	**11,687**	42
North-East	258 (0.47)	48,310 (88.3)	6,170 (11.3)	**54,738**	41
North-West	386 (0.78)	43,010 (86.9)	6,100 (12.3)	**49,496**	41
South-East	374 (0.29)	119,550 (93.3)	8,251 (6.4)	**128,175**	40
Southern	321 (0.48)	53,291 (79.3)	13,598 (20.2)	**6,721**	47
TOTAL	**3,416 (0.49)**	**596,346 (85.7)**	**95,941 (13.8)**	**695,703**	**43**

Nationally, 56 percent of all households are headed by males. Of the households headed by children, the proportions headed by females are: Central - 40.7 percent, Chobe - 50.0 percent, Ghanzi - 42.2 percent, Kgalagadi - 37.2 percent, Kgatleng - 41.4 percent, Kweneng - 42.8 percent, North East - 48.1 percent, North West - 44.3 percent, South East - 55.7 percent and Southern - 37.9 percent.

FIGURE 1: Population pyramids by districts

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Female
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90-94
85-89
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
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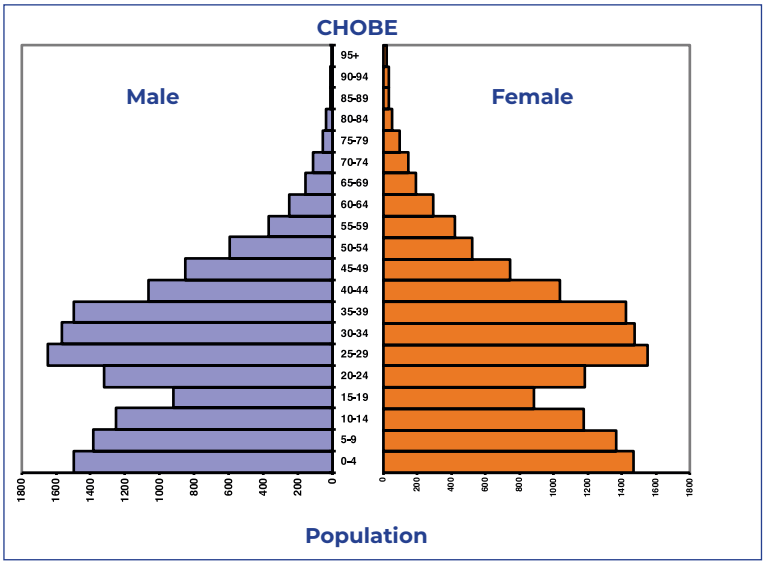
Population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Female
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65-69
60-64
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45-49
40-44
35-39
30-34
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15-19
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5-9
0-4
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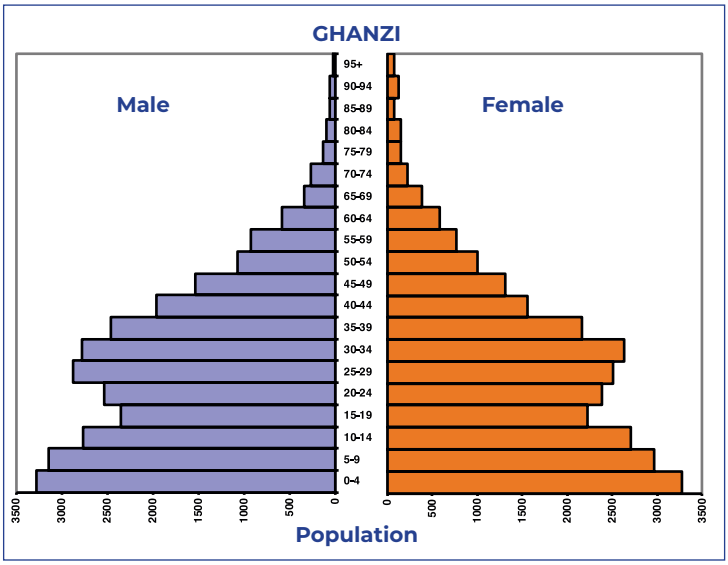
Population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Female
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45-49
40-44
35-39
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15-19
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5-9
0-4
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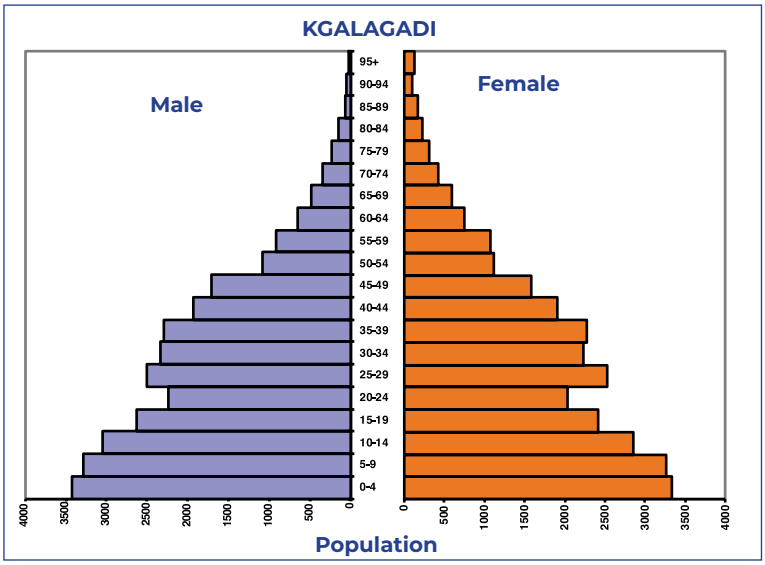
Population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Female
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80-84
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70-74
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60-64
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50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
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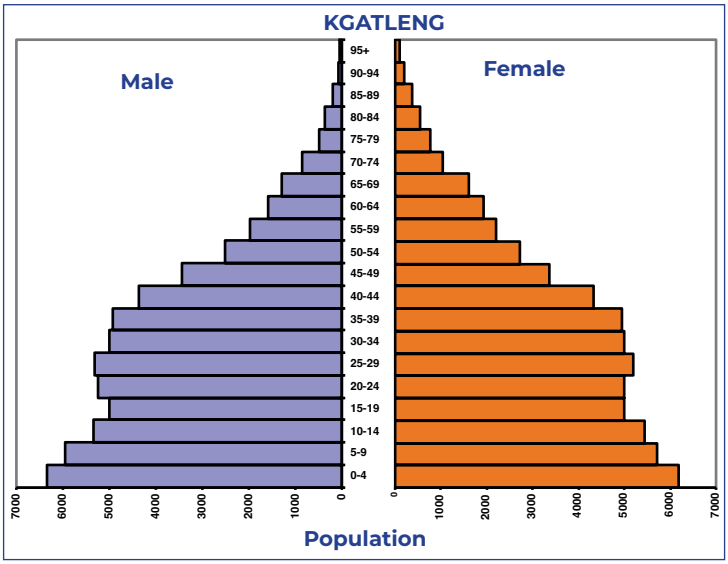
Population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Female
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80-84
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70-74
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60-64
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45-49
40-44
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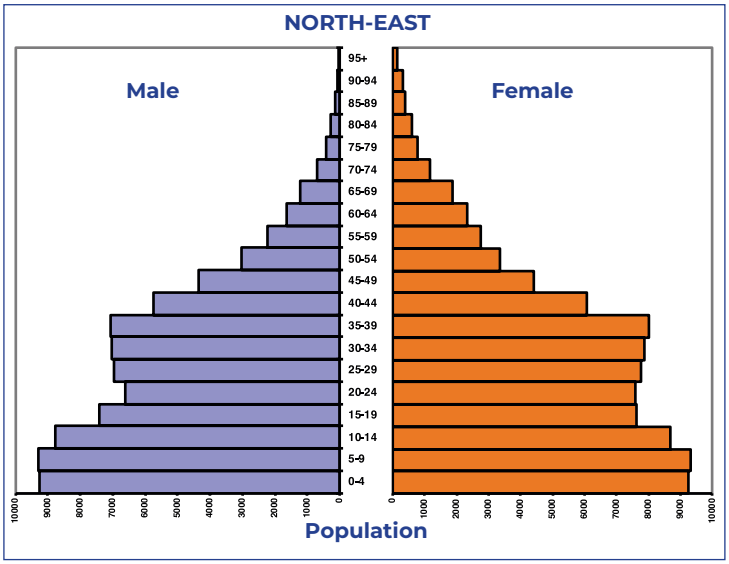
Population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25-29
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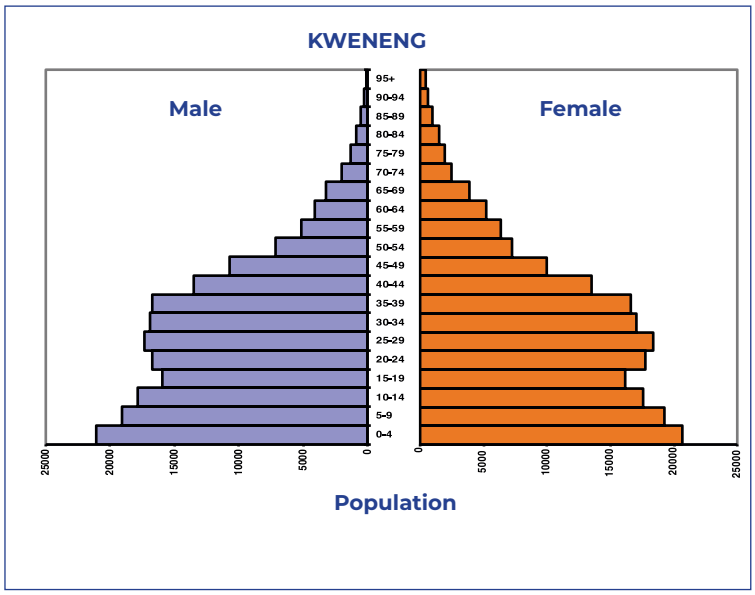
Population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40-44
35-39
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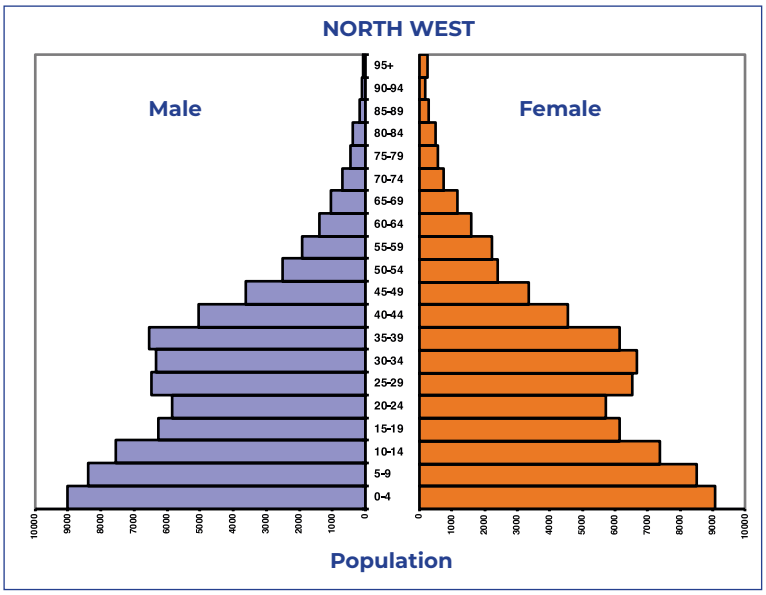
5-9
0-4
25000
20000
15000
10000
5000
0
Population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70-74
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40-44
35-39
30-34
25-29
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10-14
5-9
0-4
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9000
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6000
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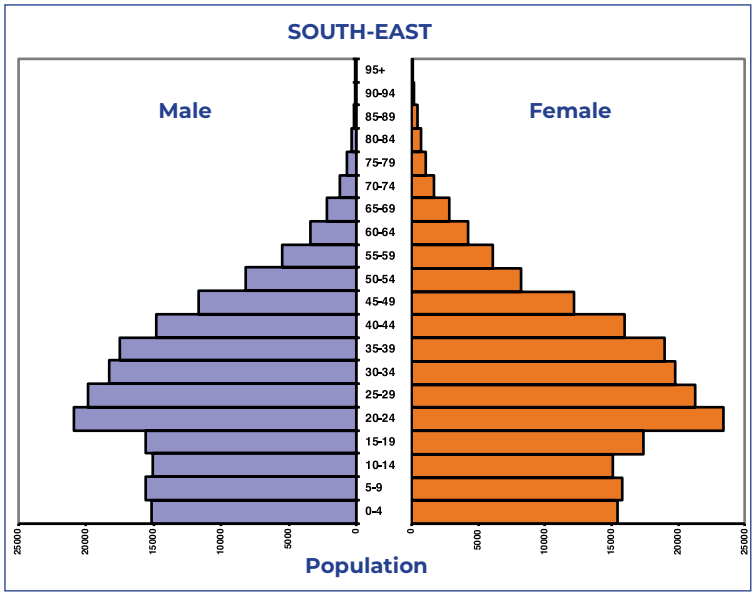
Population


SOUTH-EAST
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Female
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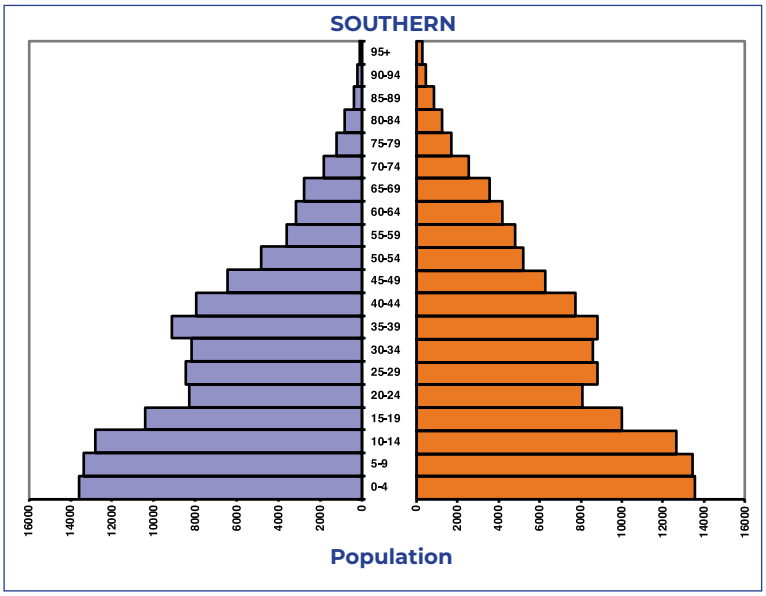
Population


SOUTHERN
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35-39
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25-29
20-24
15-19
10-14
5-9
0-4
16000
14000
12000
10000
8000
6000
4000
2000
0
Population

Marital Status of household head

Most household heads have never been married. The proportion of unmarried household heads ranged from a low of 51 percent in Ghanzi district to 58 percent in Kweneng and Kgalagadi districts. Overall, 55 percent of household heads in the country have never been married, and 25 percent were married. 9 of the children heading households, all of them female, are recorded as married. 34 children, 22 females and 12 males, were recorded as living together. The remaining children have never been married.

TABLE 3: Marital Status of Household Heads

DISTRICT	MARRIED	NEVER MARRIED	LIVING TOGETHER	OTHER	TOTAL
Central	47,718	110,420	22,782	19,495	**200,415**
Chobe	2,055	5,471	2,023	513	**10,062**
Ghanzi	2,610	7,932	3,997	975	**15,514**
Kgalagadi	3,305	9,828	2,640	1,067	**16,840**
Kgatleng	10,270	19,564	3,202	3,341	**36,377**
Kweneng	29,493	67,368	11,097	8,709	**116,667**
North-East	20,503	46,009	13,046	6,735	**86,293**
North-West	2,938	9,508	4,354	1,135	**17,935**
South-East	35,010	71,420	13,667	8,071	**128,168**
Southern	17,216	34,063	9,558	6,371	**67,208**
Total	**171,118**	**381,583**	**86,366**	**56,412**	**695,479**

4.2 Education

Education Status of household head

Overall, 76.3 percent of household heads completed school, 2.1 percent were still at school and 12.6 percent had never attended. 9 percent had discontinued schooling. South East district has the lowest percentage (4.0 percent) of household heads who never attended school. Southern district has the highest percentage at 19.9 percent.

TABLE 4: School attendance of Household Heads

DISTRICT	STILL AT SCHOOL	COMPLETED SCHOOL	DISCONTINUED	NEVER ATTENDED	NOT STATED	TOTAL
Central	2,438	145,954	22,178	29,835	16	**20,0421**
Chobe	89	7,892	1,591	490	0	**10,062**
Ghanzi	155	10,509	226	2,469	121	**15,514**
Kgalagadi	232	1,169	2,349	2,569	0	**1,684**
Kgatleng	436	28,964	2,526	4,448	3	**36,377**
Kweneng	2,684	84,876	10,423	18,539	146	**116,668**
North-East	1,045	47,107	3,956	2,625	5	**54,738**
North-West	645	35,275	5,546	797	59	**49,495**
South-East	6.055	112,841	4,133	5,141	5	**128,175**
Southern	615	45,824	7,369	13,398	3	**67,209**
TOTAL	**14,394**	**530,932**	**62,331**	**87,484**	**358**	**695,499**

Of the household heads that completed school, most of them finished secondary school (Junior or Senior). Less than 25 percent in each district obtained a degree or higher. 14,394 were still at school.

Children of school-going age (6-15 years)

Children aged between 6 and 14 years are expected to be in primary school or junior secondary school. 407,045 of the 430,528 children aged from 6 to 15 years (95.8 percent) are in school or have completed school **(Table 5).** The school attendance rate has not changed much from the 96.2 percent recorded in the 2011 census. 8266 children (1.9 percent) in this age group were recorded as either never attended school or discontinued school. The breakdown by district is: Central – 2.2 percent, Chobe – 0.8 percent, Ghanzi – 7.2 percent, Kgalagadi – 1.6 percent, Kgatleng – 1.3 percent, Kweneng – 2.3 percent, North East – 1.3 percent, North West – 2.0 percent, South East – 0.7 percent and Southern – 1.7 percent.

TABLE 5: School attendance of children 6 – 15 years old

DISTRICT	STILL AT SCHOOL	COMPLETED SCHOOL	DISCONTINUED	NEVER ATTENDED	NEVER ATTENDED	NOT STATED	TOTAL	PERCENT SCHOOL ATTENDANCE
Central	136,976	1,401	722	2,444	3,150	144,693	95.6	95.6
Chobe	4,437	47	7	30	83	4,604	97.4	97.4
Ghanzi	9,065	89	304	435	368	10,261	89.2	89.2
Kgalagadi	10,523	108	78	98	234	11,041	96.3	96.3
Kgatleng	18,944	391	49	207	447	20,038	96.5	96.5
Kweneng	61,914	1,057	396	1,112	1,329	65,808	95.7	95.7
North-East	30,758	463	45	376	771	32,413	96.3	96.3
North-West	37,032	416	230	569	1,043	39,290	95.3	95.3
South-East	52,682	1,083	64	322	1,252	55,403	97.0	97.0
Southern	44,714	449	218	560	1,036	46,977	96.1	96.1
Total	**407,045**	**5,504**	**2,113**	**6,153**	**9,713**	**430,528**	**95.8**	**95.8**

4.3 Employment Status of Household Head

407,529 household heads (58.6 percent) were working in the 7 days prior to the census. The distribution over the districts is shown in **Table 6.** The proportion of working male heads of households is higher the proportion for females in all districts. Of the 287,448 heads who were not working 41.3 percent were actively seeking work, doing housework or were either students, retired, sick or prisoners. 58.7 percent of heads who were not working did indicate what they did.

TABLE 6: Household Heads who worked in the 7 days before Census 2022

DISTRICT	MALES	PERCENT OF MALES	FEMALES	PERCENT OF FEMALES	TOTAL	TOTAL PERCENTAGE
Central	62,747	60.5	45,305	46.8	**108,052**	53.9
Chobe	4,454	77.0	2,884	67.5	**7,338**	72.9
Ghanzi	5,894	65.2	3,618	55.9	**9,512**	61.3
Kgalagadi	5,832	64.2	4,087	52.7	**9,919**	58.9
Kgatleng	13,076	61.4	6,676	44.3	**19,752**	54.3
Kweneng	41,619	61.0	21,822	45.0	**63,441**	54.4
North-East	21,049	72.3	15,454	60.3	**36,503**	66.7
North-West	14,403	57.3	11,418	46.9	**25,821**	52.2
South-East	56,714	76.0	34,920	65.2	**91,634**	71.5
Southern	22,295	61.3	13,262	43.0	**35,557**	52.9
TOTAL	**248,083**	**64.9**	**159,446**	**50.9**	**407,529**	**58.6**

4.4 Access to Household Services

4.4.1 Sources of energy

82.4 percent of all households use electricity for lighting. Electricity is obtained from the national grid (73.5 percent) or from off-grid systems such as solar systems, generators or batteries (9.0 percent). The proportion of households that use electricity from the nation grid is lowest in Ghanzi (53.2 percent) and highest in South East district (91.5 percent).

Only 26.2 percent of households use electricity as the primary energy source for cooking. 42.1 percent use gas (LPG or biogas) and 29.6 percent use wood. The use of wood as the primary energy source for cooking is high in the North West district (47.6 percent), Kgalagadi (45.3 percent) Central (43.3 percent) and Ghanzi (42.7 percent).

TABLE 7: Sources of energy for lighting and cooking

DISTRICT	ELECTRICITY FOR LIGHTING	PERCENT	ELECTRICITY FOR COOKING	PERCENT	GAS FOR COOKING	PERCENT	WOOD FOR COOKING	PERCENT
Central	158,359	79.0	44,228	22.1	64,738	32.3	86,785	43.3
Chobe	9,032	89.8	4,084	40.6	3,269	32.5	2,555	25.4
Ghanzi	10,185	65.8	3,924	25.3	4,486	29.0	6,606	42.7
Kgalagadi	11,571	68.7	4,113	24.4	4,702	27.9	7,626	45.3
Kgatleng	31,370	86.2	9,892	27.2	16,669	45.8	9,322	25.6
Kweneng	96,861	82.9	26,402	22.6	58,802	50.3	28,814	24.7
North-East	49,002	89.5	17,268	31.5	26,197	47.9	10,477	19.1
North-West	37,197	75.2	1,201	24.3	12,446	25.2	23,527	47.6
South-East	119,559	93.3	45,354	35.4	77,109	60.2	3,921	3.1
Southern	50,313	74.9	14,887	22.2	24,329	36.2	26,597	39.6
TOTAL	**573,449**	**82.4**	**182,162**	**26.2**	**292,747**	**42.1**	**20,623**	**29.6**

4.4.2 Water

The main source of drinking water infrastructure in households is piped indoors (37.5 percent) or piped outdoors (41 percent). 60.6 percent of households in South East district have water piped indoors. All other districts have less than 50 percent of households with water piped indoors. The percentage of households with water piped indoors or outdoors are: Central - 74.93, Chobe - 84.14, Ghanzi - 72.02, Kgalagadi - 71.85, Kgatleng - 84.97, Kweneng - 75.96, North East - 92.49, North West - 58.76, South East - 95.34, and Southern - 63.33.

TABLE 8: Source of water for drinking

DISTRICT	PIPED INDOORS	PIPED OUTDOORS	NEIGHBOUR'S TAP	COMMUNAL TAP	NONE	TOTAL
Central	64,444	85,717	13,726	18,285	18,239	**200,411**
Chobe	3,493	4,972	330	1,024	242	**10,061**
Ghanzi	4,621	6,539	1,529	1,556	1,251	**15,496**
Kgalagadi	4,328	7,768	1,959	1,625	1,155	**16,835**
Kgatleng	14,453	16,455	892	2,232	2,344	**36,376**
Kweneng	37,282	51,454	61	11,372	10,616	**116,824**
North-East	26,767	23,856	2,044	1,421	648	**54,736**
North-West	10,709	1,837	4,215	10,775	5,416	**49,485**
South-East	77,689	44,502	1,772	2,802	14	**128,165**
Southern	17,336	25,229	4,725	11,899	8,021	**6,721**
TOTAL	**261,122**	**284,862**	**37,292**	**62,991**	**49,332**	**695,599**

4.4.3 Sanitation

Access to adequate sanitation is one of the key requirements for households. 49.4 percent of all households have access to a flush toilet, connected to a sewer line or septic tank. 40 percent of the households have access to other types of toilets such as pit latrine, VIP latrine or dry compost. 10.9 percent do not have access to any type of toilet. Percentages of households without access to toilets in the various districts are Central - 13.69, Chobe - 6.55, Ghanzi - 30.10, Kgalagadi - 18.71, Kgatleng - 5.95, Kweneng - 9.93, North East - 2.33, North West - 29.04, South East - 1.03, Southern - 13.90

TABLE 9: Access to toilet facilities

DISTRICT	FLUSH TOILET (SEWER LINE)	FLUSH TOILET (SEPTIC TANK)	VIP LATRINE	PIT LATRINE	DRY COMPOST	NONE	TOTAL
Central	53,736	22,794	495	8,828	3,214	27,435	**200,409**
Chobe	4,839	1,295	202	2,986	80	659	**10,061**
Ghanzi	3,815	2,867	203	3,546	397	4,663	**15,491**
Kgalagadi	1,385	3,482	453	8,127	237	315	**16,834**
Kgatleng	5,337	10,475	493	17,658	250	2,163	**36,376**
Kweneng	3,323	19,796	3,484	47,549	1,162	11,602	**116,823**
North-East	33,619	6,183	853	12,714	92	1,275	**54,736**
North-West	4,424	7,978	654	20,655	14	14,368	**49,479**
South-East	99,555	8,976	1,408	16,827	80	132	**128,166**
Southern	11,572	8,439	1,989	35,083	783	9,344	**6,721**
TOTAL	**251,512**	**92,285**	**14,689**	**253,425**	**7,695**	**75,979**	**695,585**

4.4.4 Waste Disposal

Nationally, about half of all households have their refuse collected regularly. The highest proportion of regular collection of refuse is in the South East (91.1 percent) followed by North East district (84 percent), Chobe (66.4 percent), Kweneng (57.2 percent) and Ghanzi (50.1 percent). The remaining districts have regular collection rates less than 50 percent. Other methods of refuse disposal are burning (24.1 percent), burying (7.4 percent) and dumping (8.7 percent). About 4.3 percent of all households use designated disposal sites.

TABLE 10: Methods Of Waste Disposal

DISTRICT	REGULARLY COLLECTED	IRREGULARLY COLLECTED	BURNING	BURY	DUMPING	DESIGNATED DISPOSAL	OTHER	TOTAL
Central	47,186	6,539	83,968	20,706	30,531	1,062	856	**200,406**
Chobe	6,684	1,187	1,036	529	398	203	24	**10,061**
Ghanzi	7,752	1,309	2,187	1,814	1,424	901	101	**15,488**
Kgalagadi	4,775	1,323	3,603	3,037	2,741	1,315	38	**16,832**
Kgatleng	14,164	757	14,317	2,227	285	1,918	143	**36,376**
Kweneng	66,799	11,383	20,607	5,972	6,834	4,552	671	**116,818**
North-East	45,962	2,677	2,877	555	1,384	1,205	76	**54,736**
North-West	13,919	3,455	18,459	7,571	4,255	1,477	341	**49,477**
South-East	116,764	7,004	2,091	391	801	952	159	**128,162**
Southern	19,456	3,474	18,677	8,671	9,446	6,951	535	**6,721**
Botswana	**343,461**	**39,108**	**167,822**	**51,473**	**60,664**	**30,094**	**2,944**	**695,566**

4.5 Access and use of ICT resources

41.3 percent of households in the country have internet connection via ADSL, Fixed Wireless, Mobile Internet, Satellite Broadband or Fibre connection. Some households have more than one type of connection. South East district has the highest proportion of households with internet connections (60.2 percent) followed by Chobe with 56.4 percent. Use of mobile phones is high in all districts, ranging from 85.4 percent in Ghanzi to 97.1 percent in the South East district. Computer usage is low. Only 34.4 percent of all households have used a computer, with the highest proportion in South East district (57.3 percent) and lowest in Southern district (24.3 percent). Accessing the internet is at higher levels than computer usage, indicating that most households access the internet on their mobile phones. Overall, 54 percent of households have accessed the internet, with the leading districts being South East (76.5 percent), Chobe (69.5 percent) and North East (62 percent).

TABLE 11: Access and Use of ICT resources

DISTRICT	HAVE INTERNET CONNECTION	PERCENT	USED MOBILE PHONE	PERCENT	USED COMPUTER	PERCENT	USED INTERNET	PERCENT
Central	65,765	32.8	183,331	91.5	51,178	25.5	80,857	43.9
Chobe	5,671	56.4	9,563	95.0	4,325	43.0	6,678	69.5
Ghanzi	5,169	33.4	13,239	85.4	4,711	30.4	6,693	49.3
Kgalagadi	6,127	36.4	14,920	88.6	4,608	27.4	6,931	46.3
Kgatleng	16,654	45.8	34,126	93.8	11,050	30.4	17,305	50.5
Kweneng	44,503	38.1	107,593	92.1	37,448	32.0	55,407	51.0
North-East	25,379	46.4	52,500	95.9	21,779	39.8	32,678	62.0
North-West	19,032	38.5	44,560	90.0	14,491	29.3	23,077	51.5
South-East	77,172	60.2	124,424	97.1	73,488	57.3	95,656	76.5
Southern	21,951	32.7	60,899	90.6	16,364	24.3	25,021	40.9
Botswana	**287,423**	**41.3**	**645,155**	**92.7**	**239,442**	**34.4**	**350,303**	**54.0**

4.6 Land Ownership

Land ownership is important for household security. With land, households can have a roof over their heads, they can produce food or run businesses to generate income. 53 percent of all households own residential, agricultural and/or business land **(Table 12).** Of those that own land, 94.5 percent own a residential plot, 41.3 percent own an agricultural land and only 6.9 percent own a business land. The highest rates of land ownership are Kgalagadi (68.4 percent), Southern (61.2 percent) and Ghanzi (60.4 percent).

TABLE 12: Land Ownership

DISTRICT	OWN LAND	%	TYPE OF LAND OWNED					
			AGRICULTURAL	%	RESIDENTIAL	%	BUSINESS	%
Central	119,392	59.9	56,482	47.3	11,309	94.7	7,559	6.3
Chobe	5,264	52.6	1,534	29.1	5,008	95.1	433	8.2
Ghanzi	9,298	60.4	2,415	26.0	8,982	96.6	639	6.9
Kgalagadi	11,468	68.4	333	29.0	11,179	97.5	752	6.6
Kgatleng	19,246	53.1	7,899	41.0	1,804	93.7	1,661	8.6
Kweneng	52,254	44.9	23,704	45.4	48,327	92.5	3,517	6.7
North-East	27,095	49.7	10,268	37.9	25,882	95.5	1,923	7.1
North-West	29,365	59.8	12,295	41.9	27,602	94.0	174	5.9
South-East	52,354	41.0	16,966	32.4	49,447	94.4	4,472	8.5
Southern	40,943	61.2	1,665	40.7	38,816	94.8	2,283	5.6
TOTAL	**366,679**	**53.0**	**151,543**	**41.3**	**346,373**	**94.5**	**24,979**	**6.8**

5. Conclusion

Overall, there is a higher percentage increase in the number of households, relative to the increase in total population. This has contributed to the lower average household sizes observed. The median age for household heads has not changed. The dependency ratio has continued to decline. The proportion of households headed by males has also not changed compared to the Census 2011 results. The result of our analysis shows the disparities among the districts with respect to the demographic and living conditions indicators.

Population pyramids show a peculiar population structure in the South East district. The population sizes of both males and females are almost uniformly distributed among the age groups from 0 to 19, and then expands for the 20 – 39 age group. It could be that the 20-39 age group in the South East has received migrants in the past who have now matured to this age group. It could also be that the district is currently receiving migrants from other places, characteristic of a place that has strong economic pull factors for an urban industrial, administrative, and higher education district.

The proportion of households headed by children (under 18 years of age) is about 0.5 percent overall and less than 1 percent in all districts. School attendance for children between the ages of 6 to 15 years is above 90 percent, except in Ghanzi where the proportion of children who had never attended school or discontinued is 7.2 percent. A further 368 (3.6 percent) cases from Ghanzi did not state whether these children are in school or not.

Electricity (from national grid or off-grid) as an energy source lighting is above 70 percent in all districts. However, the use of firewood as the main source of energy for cooking is 40 percent or higher in five districts. The results show that there are disparities in the demographic structure of the 10 administrative districts. Access to basic services is not uniform and only 41.3 percent of all households have internet connectivity.

Policy Implications and recommendations

Rural-urban migration:

According to Gwebu (2014), the National Settlement Policy has made suggestions on how to minimize rural-urban migration such as:

- Planning for the provision of similar level of infrastructure and services to villages on the same hierarchical level with towns,
- Provision of incentives for the location of job creating activities in rural areas and villages,
- Provision of financial and other incentives to investors locating in village primary centres, in line with the Financial Assistance Policy,
- Promotional Programmes to publicize opportunities in village primary centres, and Improvement access to loans and financial resources to rural areas and villages.
- In view of the results of Census 2022, the suggested activities in the policy should be reviewed or their implementation should be fast tracked.

School attendance

Article 18 of the Children's Act (2009) states clearly that "every child has a right to free basic education". Furthermore, Botswana has an Inclusive Education Policy which sets policy goals which can be achieved through the implementation of commitment statements. In particular, the Policy Goal 1 states that "All learners will complete basic education and progress where possible to senior secondary and/or tertiary education or to vocational training". The associated commitment statements are:

Commitment Statement 1 Action will be taken to include children of school age who have never been enrolled in school.

Commitment Statement 2 Action will be taken to decrease the number of children of school age who drop out before completing their basic education.

These commitment statements must be vigorously pursued, and school attendance strictly monitored district and local levels. Action should be taken to find reasons why school age children are out of school and appropriate remedial measures implemented.

Energy for cooking

The use of firewood for cooking by a large proportion of households is not sustainable. It is recommended that alternate sources of energy, for example solar concentrators, be investigated and encouraged. Solar concentrators could be used by households on sunny days to reduce the extensive dependence on firewood.

Access to Household Services

The disparities in access to basic services such as clean water, sanitation, and electricity highlight the need for targeted interventions to improve infrastructure in underserved districts. Ensuring availability and sustainable management of these services aligns with SDG 6 and SDG 7. Enhancing access to these services will contribute to improved health and well-being and support sustainable development.

Land Ownership

Promoting land ownership is crucial for economic security and poverty reduction. Policies that facilitate land ownership can enable households to generate income and ensure food security. This aligns with SDG 1 and Vision 2036 Pillar 1, contributing to economic diversification and sustainable livelihoods.

ICT Access and Usage

The digital divide highlighted by the findings indicates a need for improving digital infrastructure to foster innovation and economic growth. Policies should focus on enhancing ICT access, particularly in underserved areas, to support modern economic activities and improve the quality of life through better communication and access to information. This will align with SDG 9 and Vision 2036 Pillar 1.

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A TREND ANALYSIS OF HOUSING CONDITIONS IN BOTSWANA USING THE 2022 POPULATION AND HOUSING CENSUS DATA.

Enock Ngome[1], Grace Mphetolang[2], Serai Daniel Rakgoasi[3],Bonolo P. Basebi[4]

EXECUTIVE SUMMARY

Introduction: Access to adequate housing is vital for human well-being and socio-economic progress, with housing conditions directly impacting living standards. This study analyses housing types and conditions in Botswana using data from the 2022 Population and Housing Census, identifying trends and challenges to inform evidence-based policies. By examining the evolution of housing materials, this analysis offers insights for policymakers, urban planners, and researchers to address housing needs and promote sustainable development for all citizens.

Methodology: The study utilizes data from the 2022 Population and Housing Census conducted by the Botswana Central Statistics Office, offering a comprehensive overview of housing conditions nationwide. With 697,245 households enumerated across 28 Census Districts, this dataset enables a detailed analysis of housing trends and patterns. Using SPSS, the analysis encompasses a descriptive overview of housing types and conditions, comparing census data from 2001 and 2011 to assess temporal changes. Additionally, the study examines housing conditions based on construction materials for walls, floors, and roofs, employing descriptive statistics and cross-tabulations to explore relationships with district and locality factors.

FINDINGS:

Types of Housing Units:

The proportion of households with access to houses constructed of nondurable materials is 9.3%, exceeding the 2010 RNPP target of 5% and highlighting the need for further efforts. However, the 2022 PHC results shows that 90.7% of households have access to quality housing, slightly surpassing the 2010 RNPP target of 90%.

Detached housing units which prevailed in Gaborone, Francistown, Lobatse, Selibe Phikwe, Jwaneng, and Sowa constituted 47.9% of households, indicating preference for this type.

Also significant are rooms at 20.9%, indicating a significant number of households in shared or rented accommodations. Central Serowe-Palapye, Central Mahalapye, Central Bobonong, Central Boteti, and Central Tutume revealed substantial proportions of rooms, indicating a prevalence of shared or rented accommodations.

Mixed housing units (14.8% overall) maintained a relative stable presence and were higher in Kweneng East, Kweneng West, and Kgatleng.

Shacks still exist at 2.8%, indicating a notable portion of the population living in informal or substandard housing.

Traditional housing units decreased significantly from 64.04% in 1991 to 5.7% in 2022. They were still predominant in the Delta district, followed by the Central Kalahari Game Reserve (CKGR).

Housing Unit Use:

88.3% of the 697245 households enumerated during the 2022 PHC were for exclusive use, whereas 11.1% were shared.

Materials for Building Walls

86.6% of households use conventional brick or blocks for housing unit walls.

Mud bricks or blocks use has declined from **15.0%** in 2001 to **5.9%** in 2022.

Use of mud and alternative materials for building walls has decreased from **9.1%** in 2001 to **2.6%** in 2022.

Corrugated iron, zinc, or tin has seen a significant increase from **1.7%** in 2001 to **3.4%** in 2022.

Other materials like asbestos, wood, stone, and miscellaneous materials have remained relatively low.

Materials for Building Floor

Cement is the most prevalent flooring material, utilized in **57%** of households, followed by floor tiles at **35.1%**.

Mud and mud/dung combinations constitute a small proportion **(5.2%)**, while a minority **(1.6%)** have no flooring.

Wood and brick/stones each comprise only **0.1%** of households, with other materials representing **0.3%.**

Materials for Roofing

Corrugated iron, zinc, or tin are predominant, comprising **76.8%** of households, followed by roof tiles at **16.7%**. This is across most Districts.

Thatch or straw roofing is utilized in **4%** of households, while slate, asbestos, concrete, and other materials collectively make up a small percentage.

Thatch usage is generally low but more prevalent in rural areas.

Slate, asbestos, concrete, and other materials collectively make up a small percentage of household roofs.

Recommendations

Strengthen targeted housing programs to cater to different needs, including affordable housing for low-income earners, shared accommodations in urban centres, and traditional housing in rural areas.

Implement regulations and standards for safe and durable housing, aligning with Article 11 of the ICESCR. Invest in infrastructure development, particularly in peri-urban areas, to make detached housing developments more sustainable and accessible.

Explore innovative financial instruments like microloans or mortgage guarantees to facilitate homeownership access.

Encourage public-private partnerships for large-scale housing development projects.

Strengthen data collection and analysis efforts to understand evolving housing needs across different demographics and regions.

Align housing policies with domestic and global frameworks to uphold human rights principles and ensure access to adequate and secure housing for all.

INTRODUCTION

Access to adequate and suitable housing is fundamental for human well-being and socio-economic development. Housing conditions, determined by the materials used for walls, floors, and roofs, significantly influence living standards and household welfare. This study conducts a trend analysis of housing types and conditions in Botswana, utilizing data from the 2022 Population and Housing Census. By examining the evolution of housing materials, patterns, disparities, and challenges are identified, informing evidence-based policies and interventions to enhance housing outcomes in the country. This analysis, utilizing census data, provides insights for policymakers, urban planners, and researchers to address housing needs effectively and promote sustainable development for all citizens.

BACKGROUND CONTEXT AND LITERATURE

Demographic Shifts and Urbanization:

Botswana, a landlocked nation in Southern Africa, is undergoing a period of significant transformation. Demographic changes, with a population growth rate of 1.4% between 2011 and 2022 (2022 Census), coupled with rapid urbanization, are placing a strain on the country's housing resources (Chiguvi, 2022; Mooki, 2006). Urbanization trends are a key factor, with major towns experiencing a surge in demand for housing (Mooki, 2006). This necessitates a focus on infrastructure development alongside housing provision to create truly inclusive and resilient urban environments (UNhabitat, 2012).

Policy Landscape and Human Right Considerations:

Botswana's Vision 2036 sets a clear goal of ensuring high-quality housing for all citizens by 2036. This commitment is supported by initiatives such as the Botswana Housing Corporation (BHC) and the Self-Help Housing Agency (SHHA), which target different income groups to address the housing supply-demand gap. The importance of access to adequate housing is underscored by its recognition as a fundamental human right, as enshrined in Article 3 and 25 of the Universal Declaration of Human Rights (UDHR) and Article 11 of the International Covenant on Economic, Social and Cultural Rights (ICESCR).

Rapid urbanization in Botswana has led to increased demand for housing, resulting in the development of residential areas in major towns. However, the housing supply fails to meet this demand, leading to high residential property prices (Mooki, 2006). Government-led social and affordable housing programs offer a more favorable situation, ensuring compliance with building codes, regulations, and national minimum standards of adequacy related to accessibility. To address the inadequate provision of urban housing, the government mandates the BHC to provide affordable housing across income brackets. Additionally, the introduction of the SHHA targets low-income urban groups, allocating funds directly to City Councils for disbursement to applicants at subsidized interest rates.

2010 Revised National Population Policy Housing Targets

The 2010 Revised National Population Policy set ambitious targets to improve housing conditions across Botswana. The primary goal was to increase population access to quality housing to 90 percent by 2016. Significant progress was observed, with the rate of quality housing reaching 86.9% by 2011. This increase indicates a positive trend towards achieving the target. A secondary target aimed to reduce the proportion of houses constructed of nondurable materials to no more than 5 percent. By 2011, 10.4% of houses were still made from nondurable materials, showing progress but also highlighting the need for continued efforts to meet the target.

Sustainable Development Goals (SDGs) and International Agendas:

The efforts to enhance housing conditions in Botswana are closely aligned with national and international development frameworks. National plans like the Transitional National Development Plan (TNDP) and Vision 2036 prioritize the provision of decent and affordable housing as a cornerstone for sustainable development. By conducting a trend analysis of housing conditions, we aim to generate valuable insights that will contribute to the realization of these development goals, ensuring that every Batswana has access to safe, adequate, and affordable housing. The study also aligns as well as international frameworks. The Sustainable Development Goals (SDGs) play a crucial role, particularly Goal 11: Sustainable Cities and Communities. Goal 11 emphasizes the need for inclusive, safe, resilient, and sustainable cities and communities, with access for all to adequate, safe, and affordable housing by 2030 (UNhabitat, 2012). Goal 1 also links housing to poverty reduction efforts. Furthermore, this research aligns with the aspirations of the African Union's Agenda 2063, which highlights the importance of providing decent housing and promoting sustainable urban development across the continent.

Sustainable housing presents the following four scenarios: 1. Cultural sustainability takes into consideration cultural worldviews and values, norms and traditions, as well as lifestyles and behaviours of occupants, communities and society. 2. The economic dimension of housing sustainability, on the other hand, arises from the fact that housing is indeed a capital asset. 3. Environmental sustainability of housing is concerned with the impacts of housing on the environment and climate change, and vice versa. 4.Social sustainability in housing relates to the integration of housing, residential areas and communities into urban and national socio-spatial systems. This study builds upon previous research that has explored housing affordability, land tenure, and the political economy aspects of housing provision (Ministry of Infrastructure and Housing Development, 2021; Aalbers, 2008; Kironde, 2006; Ball, 1996; Kombe,1995).

Understanding housing conditions is crucial for policymakers, urban planners, economic planners, policy implementers, and researchers to address housing challenges and come up with better plans for sustainable development for any progressive nation. Census data is a valuable resource for understanding population distribution, housing conditions, and related trends (UNhabitat, 2012). This paper will inform the following key specific areas 1) Policy and Planning: government agencies, urban planners, and policymakers' further comprehension of housing needs of the population. is utilized for developing policies and programs related to affordable housing, infrastructure development, and neighborhood improvement initiatives. 2) Resource allocation - for instance, areas with a high prevalence of overcrowding or lack of basic amenities like proper sanitation might be prioritized for receiving government aid or infrastructure upgrades. 3) Research and Analysis: Researchers and analysts can leverage census data to study trends in housing conditions over time. Drawing from the 2022 Population and Housing Census Data, this paper intends to provide valuable insights into the housing conditions, and related trends in Botswana.

Goal and Objectives

This paper aims to conduct a comprehensive analysis of trends in housing conditions within Botswana. It will achieve this objective through the following specific goals:

- Identify key trends: Analyze data and reports to identify the prevailing trends in housing conditions across Botswana. This will encompass aspects like housing types, construction materials used for building walls, materials used for floors and materials used for roof.

- Examine district and rural/urban locality patterns: Investigate patterns on housing types, construction materials used for building walls, materials used for floors and materials used for roof by district and rural/urban locality patterns.

By achieving these objectives, the paper will provide valuable insights into the current state and future prospects of housing in Botswana. This information can be used by policymakers, planners, developers, and other stakeholders to develop strategies for ensuring adequate and affordable housing for all citizens. This comprehensive analysis will contribute to a deeper understanding of the complex issue of housing in Botswana and inform the development of effective solutions for the future.

METHODOLOGY

Data Source: The primary data source for this study is the 2022 Population and Housing Census conducted by the Botswana Central Statistics Office. It serves as a comprehensive and representative source of data for this study and provides a wealth of information on housing conditions across the country, allowing for a detailed and nuanced analysis of trends and patterns. By utilizing this dataset, we can uncover valuable insights into the dynamics of housing materials, assess progress made in improving housing conditions, and identify areas that require further attention and intervention. The total number of households enumerated during the 2022 PHC totals 697,245 in a total of 28 Census Districts (CKGR and Delta included as Census Districts).

Data Analysis Approach: Using the latest version of SPSS, the analysis begins with a descriptive overview of the trends in the housing types and household housing conditions in Botswana. Trends over time will also be analysed by comparing the current census data with previous 2001 and 2011 census years data, enabling an assessment of changes in housing types and housing conditions. The analysis further examines housing conditions by examining the distribution of different construction materials for walls, floors, and roofs. Descriptive statistics, such as frequencies and percentages, will be employed to summarize the distribution of housing conditions. Cross-tabulations were utilized to explore relationships between housing conditions and other relevant factors, such as district and locality.

Findings and Discussions

The 2022 Population and Housing Census revealed that there were 697,245 households in total. This is a significant increase from 404,706 households in 1991 to 550,946 households in 2011. Out of the 697245 households enumerated in 2022, 0.6% (3902 households) did not have any housing units. This underscores the ongoing challenges in addressing housing needs Botswana. **Figure 1** provides a percentage distribution of households by types of housing units.

Types of Housing Units

Trends In Percentage Distribution of Households by Types Of Housing Units

The analysis from **Figure 1** outlines the percentage distribution of households by types of housing units during the 2022 Population and Housing Census. The housing units are categorized into various types, including Traditional, Mixed, Detached, Semi-detached, Townhouse/Terraced, Flats/Apartment, Part of commercial building, Movable, Shack, Rooms, and None. **Table 1** and **Figure 2** illustrates trends in the percentage distribution of households since 1991. Detached housing units currently constitute the highest percentage at 47.9%, indicating a preference for this type. The proportion of detached units has gradually increased from 20.06% in 1991 to 47.9% in 2022.

TABLE 1: Trends in the Percentage Distribution of Housing Units by types of Housing: 1991, 2001, 2011 and 2022.

TYPE OF MATERIALS	1991	2001	2011	2022
Traditional	64.04	22.17	13.2	5.7
Mixed	-	18.65	10.0	14.8
Detached	20.06	34.08	43.4	47.9
Semi- detached	2.70	4.43	4.6	4.0
Town house/Terraced	1.02	2.84	1.9	1.3
Flats, Apartment	0.47	0.85	1.5	1.9
Part of commercial building	0.07	0.20	0.1	0
Movable	1.53	1.24	0.7	0.2
Shack	1.12	1.70	1.7	2.8
Rooms	7.54	13.81	22.9	20.9
None	-	-	-	0.6
TOTAL HOUSEHOLDS	**276,209**	**404,706**	**550,946**	**697,245**

Rooms represent a significant portion at 20.9%, suggesting a considerable number of households reside in shared or rented accommodations. The proportion of rooms has steadily increased from 7.54% in 1991 to over 20% in 2022, indicating a trend towards shared or rented accommodations or solitary living preferences.

Mixed housing units, likely comprising a variety of types, account for 14.8%. Although the percentage has fluctuated slightly over the years, mixed housing has maintained a relatively stable presence.

Shacks represent 2.8%, indicating a notable portion of the population living in informal or substandard housing. The proportion of shack housing units has risen slightly from 1.12% in 1991 to 2.8% in 2022.

Semi-detached, Flats/Apartment, and Traditional housing units each represent smaller proportions, ranging from 4% to 5.7%. There has been a significant decrease in traditional housing units, from 64.04% in 1991 to 5.7% in 2022, signalling a shift towards other types.

FIGURE 1: Percentage Distribution of Households by Types of Housing

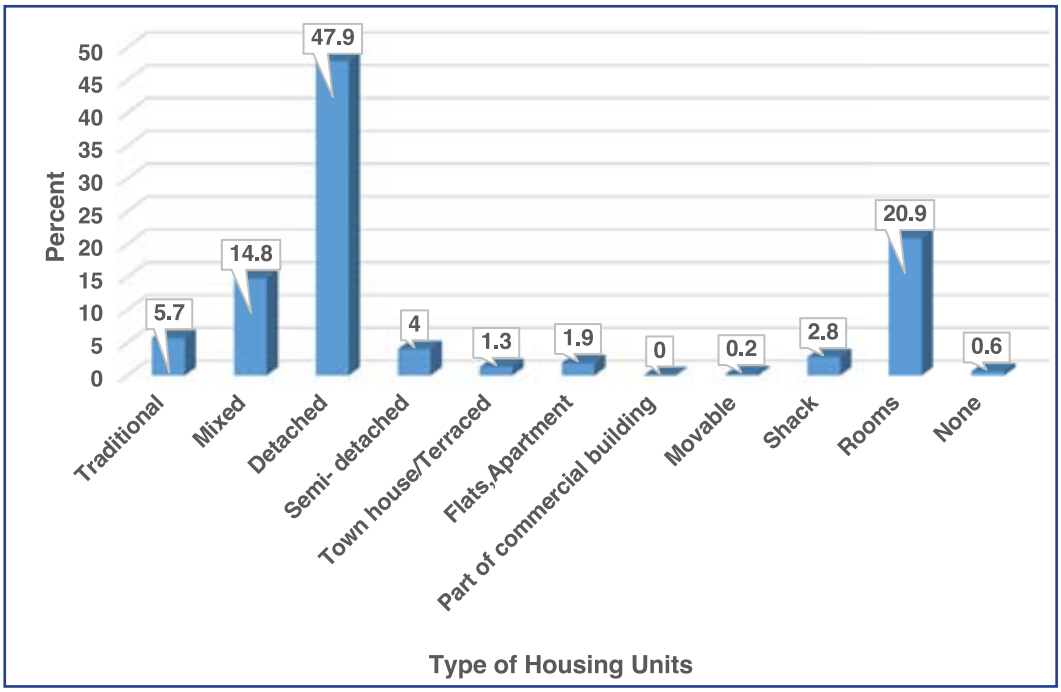
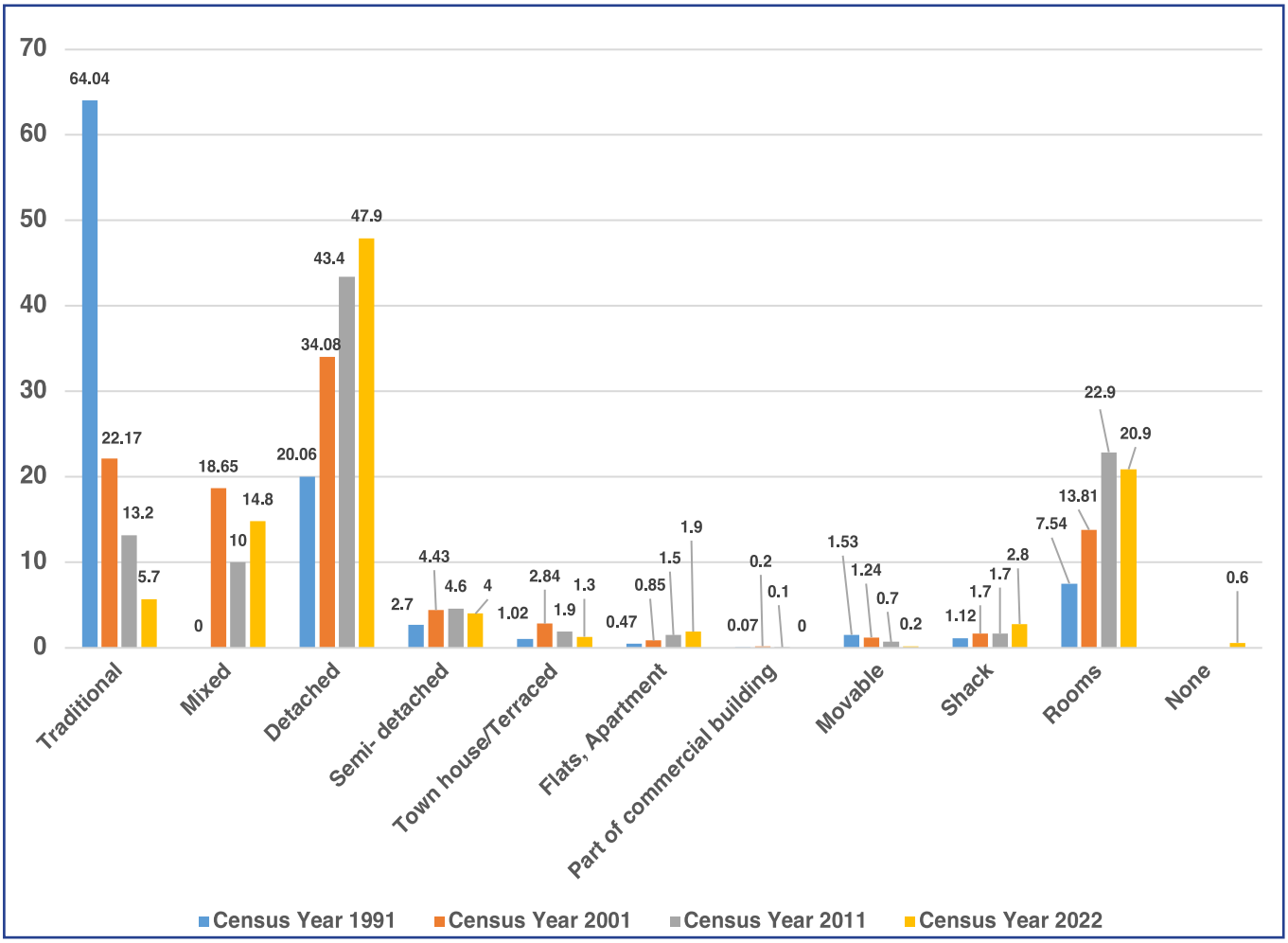


FIGURE 2: Percentage Distribution of Households by types of Housing Units and Types of Housing



The proportion of semi-detached units has remained relatively stable over the years, with slight fluctuations. Townhouse/Terraced and Flats/Apartment housing units show minor fluctuations but maintain consistent proportions.

Categories such as Part of commercial building, Movable, and None collectively contribute less than 1% to the total housing units by 2022. These categories exhibit declining trends over time, indicating a decrease in housing units within commercial buildings or movable structures since 1991. The category representing no housing units appears only for the 2022 census, indicating a small percentage of households without any housing units.

Overall, the results provide valuable insights into the diversity of housing types in Botswana. Detached units are the most prevalent, followed by rooms, mixed units, and others. However, the data also highlight potential housing challenges, such as the presence of shacks and a significant portion of the population living in shared accommodations. Additionally, the results reveal shifting trends in housing preferences over the years, with increases in detached housing and shared accommodations, and decreases in traditional housing, shacks, movable units, and commercial building housing units. The proportion of households with access to houses constructed of nondurable materials stands at 9.3%, indicating that it is still above the target of 5%, underscoring the need for continued efforts to meet this goal. Encouragingly, the 2022 Population and Housing Census (PHC) results indicate that 90.7% of households had access to quality housing, surpassing the 2010 Revised National Population Policy (RNPP) housing target of 90%.

Distribution of Housing Units by Types of Housing and District

Table 5 shows the percentage distribution of households by housing units by housing types and district. The percentage distribution of housing units by type across different census districts is indicated by table 5. Results reveal significant differences in housing units by districts.

In Gaborone, Francistown, Lobatse, Selibe Phikwe, Jwaneng, and Sowa, detached housing units prevail, each constituting over 50% of the total. Gaborone and Francistown also boast higher percentages of households residing in rooms, at 27.5% and 35.2%, respectively. Orapa notably exhibits an overwhelming preference for detached housing, with a staggering 84% proportion.

The Delta district showcases a remarkable affinity for traditional housing units, with a commanding 91.7% majority, indicative of a strong cultural or historical inclination. Following closely is the Central Kalahari Game Reserve (CKGR) at 88.1%. In Ngamiland West, traditional housing units account for approximately one-third (33.9%) of households.

Ngwaketse West, Ghanzi, Ngamiland East, Kgalagadi South, Kgalagadi North, Southern, and Barolong demonstrate relatively higher proportions of traditional housing units, ranging from 3.1% to 11.9%, compared to other districts, suggesting entrenched cultural or historical ties to this housing type.

Kweneng East, Kweneng West, and Kgatleng exhibit comparatively higher percentages of mixed housing units at 13.4%, 28.6%, and 7.5%, respectively, implying a broader spectrum of housing options available in these locales.

Central Serowe-Palapye, Central Mahalapye, Central Bobonong, Central Boteti, and Central Tutume reveal substantial proportions of rooms, ranging from 19.0% to 31.6%, indicating a prevalence of shared or rented accommodations in these regions.

Chobe district notably stands out with a significantly higher percentage of households residing in rooms, reaching 42.7%, underscoring a pronounced concentration of shared or rented accommodations in this area.

Distribution of Housing Units by Types of Housing and Locality

Table 6 shows the percentage distribution of households by housing units by housing types and locality. Census results reveal significant differences in the proportion of households by types of housing units and locality. In towns and cities, detached housing units dominate with 57.1%, indicating a preference for standalone homes in urban areas. Rooms also feature prominently at 27.4%, suggesting a significant number of shared or rented accommodations. Traditional housing units are minimal at 0.1%, reflecting modern housing preferences in these locales.

Similar to towns and cities, detached housing units are prevalent at 53.8% in urban villages, indicating a preference for standalone homes even in semi-urban settings. However, urban villages show a higher proportion of mixed housing units at 12.0%, suggesting a more diverse range of housing options. Rooms remain significant at 24.8%, indicating a substantial number of shared or rented accommodations.

In rural areas, traditional housing units take the lead at 15.3%, reflecting a preference for more traditional living arrangements. Mixed housing units are also notable at 27.2%, indicating a blend of different housing types. Rooms represent 11.9% of housing units, suggesting a notable portion of shared or rented accommodations even in rural settings.

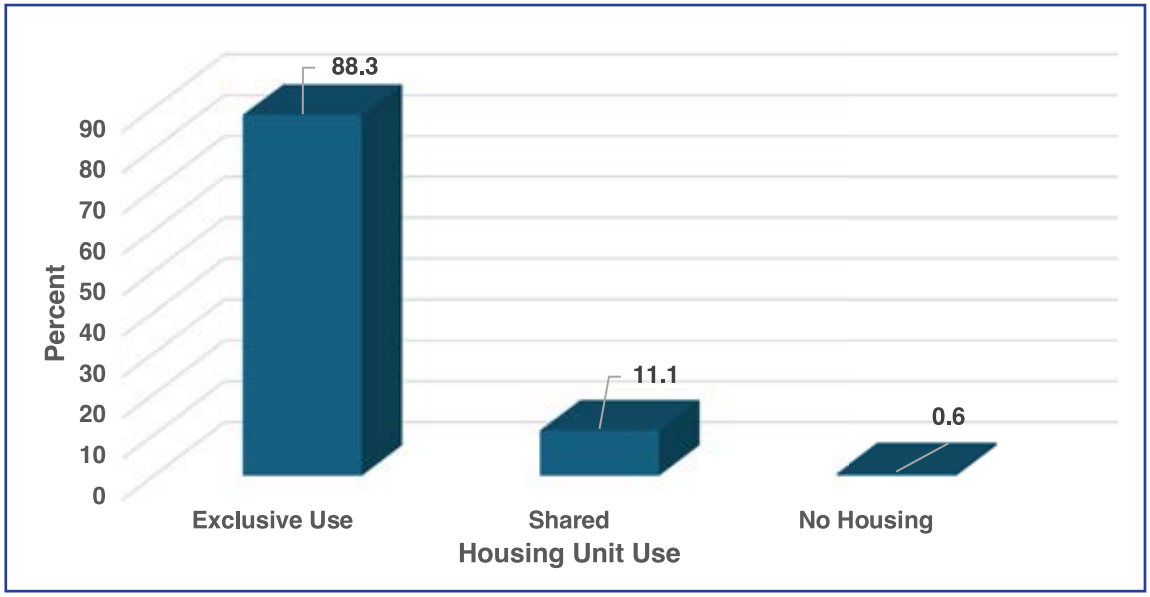
These differences highlight varying housing preferences and patterns across different types of localities. While detached housing is prevalent across all areas, urban settings tend to have a higher proportion of rooms, indicating a higher prevalence of shared accommodations. In contrast, rural areas exhibit a higher proportion of traditional housing units, reflecting cultural and historical preferences. Mixed housing units are more common in urban villages, indicating a more diverse housing landscape.

Housing Unit Use

Proportion of Housing Units by Housing Use

Of the 697245 households enumerated during the 2022 PHC, 88.3% of the housing units were for exclusive use whereas 11.1% were shared. **Figure 3** provides a pictorial view of the distribution of household units by housing unit use.

FIGURE 3: Percentage Distribution of Household Units by Housing Unit Use



Distribution of Housing Units by Housing Unit Use and District

Table 7 analysis of housing units by housing unit use across different census districts reveals significant differences. Census districts with a prevalence of households exceeding 90% of their households with exclusive use of their housing units, include Lobatse (90.0%), Barolong (92.5%), Central Serowe -Palapye (91.7%), Central Mahalapye (93.1%), Central Bobonong (94.7%), Central Tutume (90.1%), North East (92.8%), CKGR (96.4%), Kgalagadi South (92.2%), Kgalagadi North (92.0%). These districts exhibit a strong preference for private housing arrangements.

Overall, shared housing usage remains relatively low across most districts, with exclusive use being the dominant preference. Only Jwaneng and Sowa Census Districts had higher percentages of shared housing usage beyond 20% (35.3% and 20.3% respectively). However, districts with higher percentages of shared housing usage may indicate specific socioeconomic factors influencing household living arrangements. These variations highlight the diverse housing preferences and living arrangements across different census districts, reflecting the unique social, economic, and cultural contexts of each locality.

Distribution of Housing Units by Housing Unit Use and Locality

Table 8 shows the percentage distribution of housing units by housing unit use across different localities. While the majority of households in towns and cities prefer exclusive use of their housing units (83.2%), a notable proportion (16.3%) opt for shared housing arrangements. This suggests a relatively higher prevalence of communal living or shared accommodations in urban centers compared to other localities. Urban villages exhibit a higher preference for exclusive use of housing units, with 89.8% of households opting for this arrangement. However, there is still a significant percentage (9.6%) of households choosing shared housing, indicating a diverse range of living arrangements in semi-urban settings. Similar to urban villages, rural areas also show a strong preference for exclusive use of housing units, with 89.6% of households opting for this arrangement. However, there is a slightly higher percentage (9.8%) of households choosing shared housing compared to urban villages, suggesting a higher prevalence of communal living arrangements in rural settings.

Materials Used for Building Walls

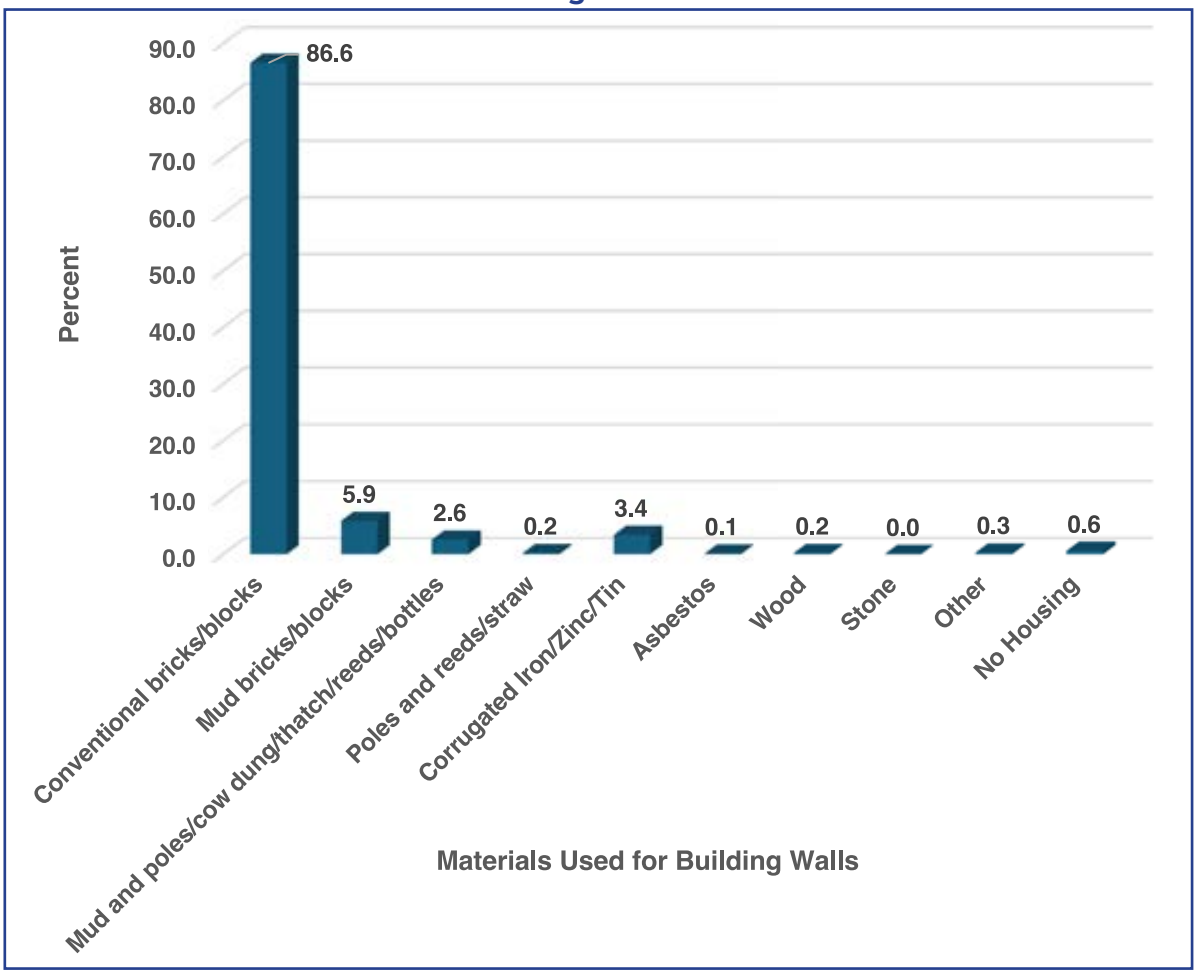
Trends in Materials Used for Building Walls for Household Main House

Figure 4 illustrates the percentage distribution of materials utilized for constructing walls for the main house during the 2022 Population and Housing Census. Among the 967,245 households surveyed, merely 0.6% lacked housing units. Conversely, a significant 86.6% of households employed conventional brick or blocks for their housing unit walls. Following closely, 5.9% of households utilized mud bricks or blocks for construction. Additionally, materials such as corrugated iron, zinc, or tin accounted for 3.4%, while mud, poles, cow dung, thatch, reeds, or bottles constituted 2.6% of households. Other less prominent materials, including poles and reeds straw, asbestos, wood, stone, and any other miscellaneous materials, collectively comprised less than 0.3% of households each.

Analysing the trends in the types of materials used in building walls of the main house for households in Botswana from 2001 to 2022 reveals several significant shifts in construction preferences **(See Table 2**) Over the years, there has been a consistent preference for conventional bricks or blocks, with usage rates remaining relatively stable. Despite a slight decrease from 87.4% in 2017 to 86.6% in 2022, the majority of households continue to rely on this traditional building material. The use of mud bricks or blocks has significantly declined from 15.0% in 2001 to 5.9% in 2022. This indicates a gradual shift away from traditional mud-based construction methods towards more modern and durable materials. Similarly, the use of mud combined with alternative materials has decreased substantially from 9.1% in 2001 to 2.6% in 2022. This trend reflects a move towards more standardized and reliable construction practices.

Table 2 also shows a noticeable increase in the use of corrugated iron, zinc, or tin for building walls, rising from 1.7% in 2001 to 3.4% in 2022. This suggests a growing concern as this would not be construed as a type of modern construction materials. The use of corrugated iron, zinc, or tin for building walls is mainly an alternative to using concrete brick or blocks, possibly due to factors such as affordability and availability.

FIGURE 4: Percentage Distribution of Households by type of Materials Used for Building Walls for the Main house.



The usage of other materials, including asbestos, wood, stone, and miscellaneous materials, has remained relatively low throughout the years, collectively comprising less than 1% of households. This indicates a consistent reliance on conventional and modern building materials among households.

TABLE 2: Trends in the Percentage Distribution of Households by type of materials used for building the walls of the Main House: 2001, 2017 BDS and 2022.

TYPE OF MATERIALS	2001	2017 BDS	2022
Convectional Bricks/Blocks	70.4	87.4	86.6
Mud Bricks/Blocks	15	5.7	5.9
Mud & Poles/ Cow-dung/Thatch/Reeds/Bottles	9.1	3.9	2.6
Poles & Reeds	1.5	0.3	0.2
Corrugated Iron/Zinc/Tin	1.7	1.8	3.4
Asbestos	0.5	0.1	0.1
Wood	0.6	0.2	0.2
Stone	0.1	-	0
Other	1.1	0.6	0.3
Unknown/No Housing	0.1	-	0.6
Total Households	404,706	649,806	697,245

Distribution of Households by type of Materials Used for Building Walls for Household Main House by District

Table 9 in the appendix shows the percentage distribution of households by type of materials used for building walls for the main house by census district. Results from the analysis reveals significant variations by census districts. Urban census districts such as Gaborone, Francistown, Lobatse, Selibe Phikwe, Orapa, Sowa and Jwaneng demonstrate a high prevalence of conventional bricks or blocks, with usage rates ranging from 94.1% to 99.4%. This indicates a strong preference for durable and standardized construction materials in urban and industrial areas. Other census districts with a prevalence beyond 90% of conventional bricks or blocks include South East, Kweneng East and the North East.

Districts like Southern, Barolong, Kgatleng, Central Serowe -Palapye, Central Mahalapye, Central Bobonong, Central Tutume, Chobe and Kgalagadi North exhibit moderate usage rates of conventional bricks or blocks, ranging from 82.2% to 89.5%. While still favouring conventional materials, these areas show slightly lower reliance compared to urban centres. The rest of the other census districts such as Central Boteti, Ngamiland East, Delta, Ghanzi, CKGR and Kgalagadi South display rates lower than 80%. Most notable is Ngwaketse West, Kweneng West, and Ngamiland West with relatively lower usage rates of conventional bricks or blocks, ranging from 58.2% to 64.3% suggesting a greater diversity in construction practices, with a notable proportion of households opting for alternative building materials.

The usage of mud bricks or blocks is notable in some districts, such as Ngamiland East and Ghanzi, with percentages ranging from 8.5% to 30.7%. These areas likely have environmental or cultural factors influencing the choice of construction materials. Some districts exhibit mixed usage patterns, with varying proportions of different materials. For instance, Central Boteti and Chobe show diverse material usage, including mud, corrugated iron, and conventional bricks or blocks. This diversity could be attributed to factors such as geographical location, local traditions, and economic considerations. The Delta census district stands out with a majority of households using mud and poles, cow dung, thatch, reeds, or bottles for building walls (57.8%), reflecting traditional construction practices in the region. Central Kalahari Game Reserve (CKGR) district predominantly relies on unconventional materials like mud and poles, cow dung, thatch, reeds, or bottles (88.1%), reflecting a unique lifestyle of its inhabitants.

[6]BDS represents the Botswana Demographic Survey. With an estimated population of 2,154,863 and average household size of 3.3, the estimated number of households during the 2017 BDS is 652,989

Distribution of Households by type of Materials Used for Building Walls for Household Main House by Locality

Table 10 shows the percentage distribution of households by the type of materials used for building walls for the main house across different localities in Botswana. Results indicate reveals differences by localities.

Towns and cities exhibit a high prevalence of conventional bricks or blocks, with a usage rate of 95.8%. This indicates a strong preference for standardized construction materials in urban areas, likely due to factors such as availability, infrastructure, and modernization.

Urban villages also show a high usage rate of conventional bricks or blocks, at 95.1%. Similar to towns and cities, urban villages prioritize durable and standardized construction materials, reflecting urbanization trends and economic development.

Rural areas demonstrate a diverse range of construction materials, with a significantly lower usage rate of conventional bricks or blocks at 70.1%.

Mud bricks or blocks and mud and poles, cow dung, thatch, reeds, or bottles are more commonly used in rural areas, reflecting traditional construction practices and possibly limited access to modern building materials.

Corrugated iron, zinc, or tin usage is noticeable across all localities, with usage rates ranging from 0.7% to 8.2%. This suggests the widespread availability and affordability of these materials, which are often used for roofing purposes.

Rural areas have the highest usage rate of mud and poles, cow dung, thatch, reeds, or bottles at 7.0%, indicating a reliance on traditional and locally sourced materials for construction. Other materials such as asbestos, wood, stone, and miscellaneous materials show minimal usage across all localities, each accounting for less than 1% of households.

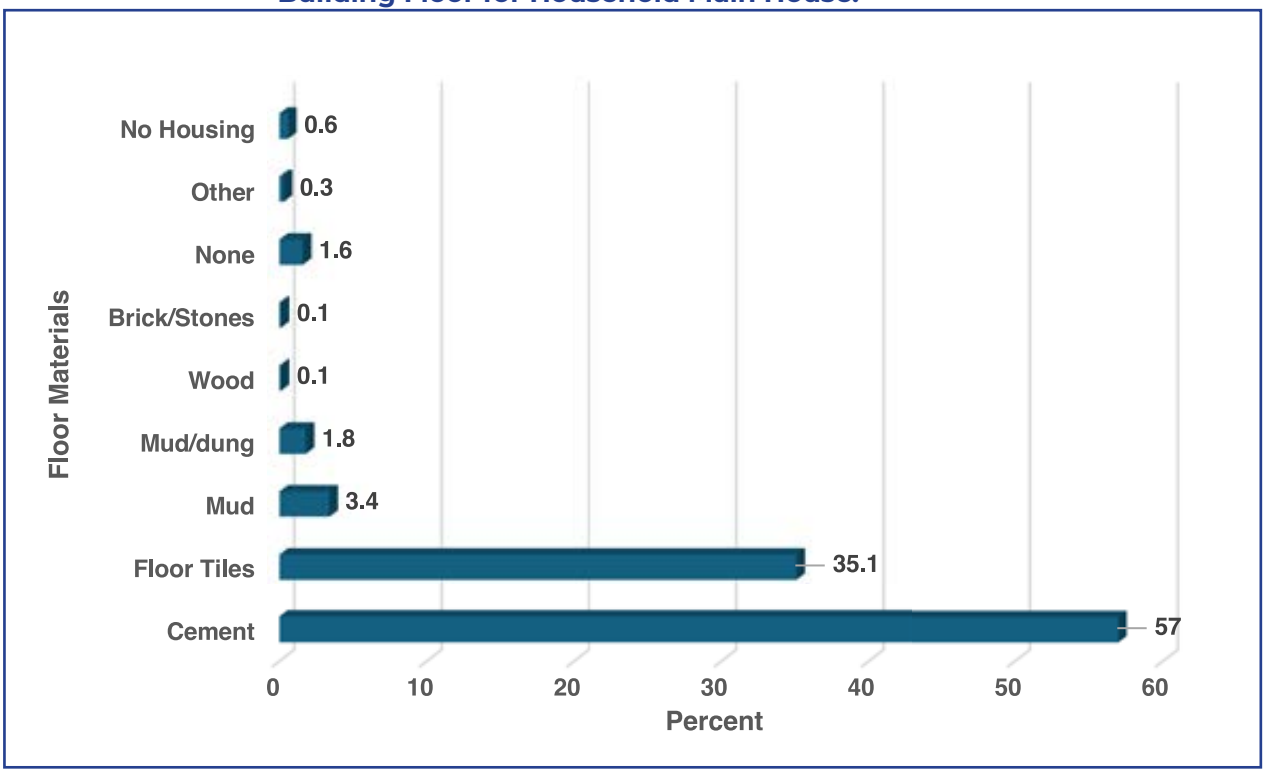
Materials Used for Floors

Trends in Materials Used for Floor for Household Main House

Figure 5 is a chart showing the percentage distribution of household units by materials used to build the floor of the main house and the results reveals several notable patterns.

Cement is the most commonly used material for building floors, accounting for 57% of households. Its widespread usage indicates the popularity of this durable and versatile material, which is commonly associated with modern construction practices. Floor tiles are the second most popular choice, representing 35.1% of households. This suggests a preference for aesthetics and easy maintenance, as floor tiles offer a wide range of designs and are relatively easy to clean.

FIGURE 5: Percentage of Household Units by Materials Used for Building Floor for Household Main House.



Mud and mud/dung combined make up a relatively small percentage (5.2%) of floor materials. This usage may reflect traditional construction practices, particularly in rural areas where access to modern construction materials like cement may be limited.

A small percentage (1.6%) of households have no flooring, indicating either incomplete construction or informal housing arrangements. Wood and brick/stones each make up only a very small fraction of households (0.1% each). Other materials represent only 0.3% of households, indicating a very minor presence of alternative flooring materials.

Table 3 presents an analysis of trends in the percentage distribution of households by type of materials used for building the floor. The results reveal several notable changes over time. In 2001, cement was the predominant flooring material, accounting for 78.1% of households, while mud and mud/dung constituted significant percentages at 18.0% and 1.8%, respectively. However, by 2017 BDS and 2022, there has been a noticeable decline in the use of mud and mud/dung, with cement remaining the most common flooring material, though with a decrease to 61.3% in 2017 BDS and further to 57% in 2022. Additionally, there has been an increase in the use of floor tiles from 29.4% in 2017 BDS to 35.1% in 2022. Conversely, the proportion of households with no flooring material or using other materials has seen a slight decrease over the years. Overall, these trends indicate a gradual shift towards more modern flooring materials such as cement and floor tiles, potentially reflecting improvements in housing infrastructure and construction practices

TABLE 3: Trends in the Percentage Distribution of Households by type of materials used for building Floor: 2001, 2017 BDS and 2022.

TYPE OF FLOOR MATERIALS	2001	2017 BDS	2022
Cement	78.1	61.3	57
Floor Tiles	-	29.4	35.1
Mud	-	-	3.4
Mud/Dung	18	7.8	1.8
Wood	0.3	0.2	0.1
Brick/Stones	0.2	0.1	0.1
None	0.2	-	1.6
Other	3.3	1.2	0.3
No Housing	-	-	0.6
Total Households	**404,706**	**649,806**	**697,245**

Materials Used for Building Floor for Household Main House by District

Table 11 presents the percentage distribution of households categorized by the materials used for constructing floors in the main house by census districts. The data underscores notable disparities among census districts. Specifically, districts such as Jwaneng, Sowa, Southern, Barolong, South East, Kweneng East, Kgatleng, North East, and Chobe exhibit a predominance of households (over 90%) with floors made of either cement or floor tiles.

Conversely, census districts with more than 5% of households having floors constructed with mud or mud and dung include Ngwaketse West, Kweneng West, Central Serowe-Palapye, Central Mahalapye, Central Bobonong, Central Boteti, Central Tutume, Ngamiland East, Ngamiland West, and Delta. Notably, Delta stands out with the highest proportion of household units (90.1%) with floors made of mud or mud with dung, while nearly a quarter of Ngamiland West household units (24.8%) share this characteristic. Other districts with more than 10% of household unit floors built with mud or mud and dung include Ngwaketse West (11.3%), Kweneng West (13.1%), Central Boteti (14.2%), and Central Tutume (10.4%), suggesting reliance on traditional construction methods or rural living conditions.

Moreover, wood and brick/stone usage are minimal across most districts, indicating limited adoption of these materials. Additionally, the percentage of households with no flooring is notably high in the CKGR (51.2%) and Ghanzi (10.2%) districts, suggesting higher prevalence possibly due to less developed infrastructure and rural living conditions.

Materials Used for Building Walls for Household Main House by Locality

In towns and cities, the predominant choice for flooring materials is either cement or floor tiles (99%), indicating a strong preference for modern and durable materials (See Table 12). Conversely, rural areas exhibit a more diverse range of flooring materials, with a majority opting for cement (63.6%), followed by mud (9.0%) and mud/dung (5.1%). This suggests a blend of modern and traditional construction methods, reflecting the rural lifestyle and possibly limited access to modern materials.

Urban villages strike a balance between the urban and rural preferences, with a majority of households opting for either cement (57.1%) or floor tiles (41.1%). However, there is a slightly higher proportion of households with mud (0.6%) and mud/dung (0.2%) floors compared to towns and cities, indicating a slightly greater influence of traditional building practices.

Furthermore, the percentage of households with no flooring is relatively low across all localities. Rural areas exhibit a higher proportion (4.2%) compared to towns and cities (0.1%) and urban villages (0.2%), suggesting disparities in housing conditions and infrastructure development.

Materials Used for Roof

Trends in Materials Used for Roof for Household Main House

Figure 6 shows the percentage distribution of household units by the type of materials used for constructing the roof in 2022. The data reveals that corrugated iron, zinc or tin is the material most used for roofing, accounting for the majority of households at 76.8%. Its popularity is likely due to its affordability and durability, making it a practical choice for many households. Roof tiles are the second most common roofing material, representing 16.7% of households. This material is often chosen for its aesthetic appeal and longevity, particularly in urban areas or where affordability allows.

Thatch or straw roofing is used in 4% of households. This traditional roofing material is still preferred in certain rural areas due to its natural insulation properties and availability. Slate, asbestos, concrete, and other materials collectively make up a small percentage of household roofs, each accounting for less than 1% of households. They may be used in specific circumstances or regions where their unique properties are advantageous.

FIGURE 6: Percentage Distribution of Households by type of materials used for roof of the Main House.

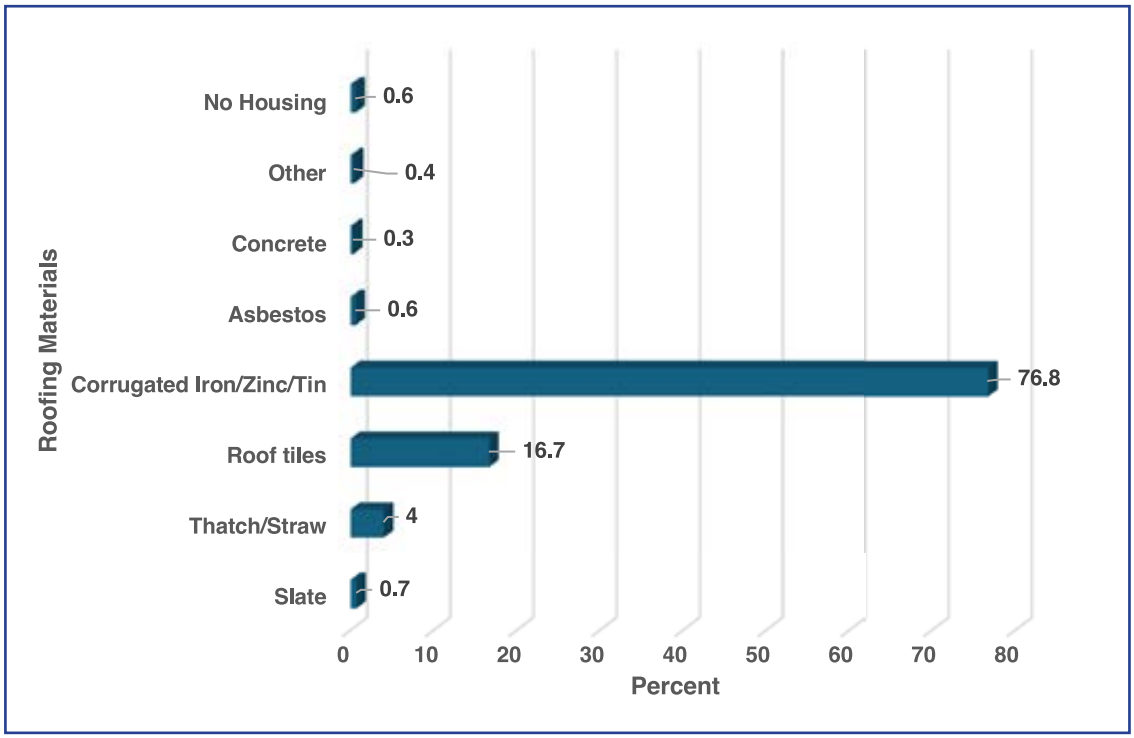


Table 4 shows the trends in the types of materials used for constructing the roof of the main house for households in Botswana from 2001 to 2022. The table shows that corrugated iron, zinc or tin has remained the most popular choice over the years, with a slight decrease from 77.4% in 2017 to 76.8% in 2022. Despite this slight decline, it continues to be the predominant choice for roofing due to its affordability and durability. There has been a steady increase in the use of roof tiles, rising from 6.0% in 2001 to 16.7% in 2022. This indicates a growing preference for roof tiles, possibly driven by urbanization, economic development, and aesthetic considerations. While still significant in rural areas, the use of thatch as a roofing material has declined from 22.1% in 2001 to 4% in 2022. This decline may be attributed to

urbanization, availability of alternative materials, and changing preferences. Slate, asbestos, concrete, and other materials collectively make up a small percentage of roofing materials and have remained relatively stable over the years. They are likely used in specific circumstances or regions where their unique properties are advantageous.

TABLE 4: Trends in the Percentage Distribution of Households by type of materials used for roof of the Main House: 1971, 1981, 1991, 2001, 2011 and 2022.

TYPE OF ROOF MATERIALS	2001	2017 BDS	2022
Slate	0.2	0.2	0.7
Thatch	22.1	6.4	4
Roof Tiles	6	14.6	16.7
Corrugated Iron/Zinc/Tin	68.9	77.4	76.8
Asbestos	1.4	0.5	0.6
Concrete	0.3	0.4	0.3
Other	1	0.5	0.4
No Housing	..	..	0.6
Total Households	**404,706**	**649,806**	**697,245**

Materials Used for Building Roof for Household Main House by District

Table 13 shows the percentage distribution of households by type of materials used for building roofs in different census districts. Focusing on significant differences between districts, we notice that both roof tiles and corrugated iron, zinc or tin are the predominant roofing material across most districts, with proportions ranging beyond 90% when the two materials are combined. In nearly all districts, the proportion of household units with roofs constructed using either roofing tiles or corrugated iron, zinc, or tin exceeds 90%. However, Selibe Phikwe, Kweneng West, Central Boteti, Central Tutume, Ngamiland West, Delta, and CKGR are exceptions to this trend. Notably, Ngamiland West (67.2%), CKGR (10.7%), and Delta (8.3%) are the only three districts where less than 80% of household units have roofs constructed with roofing tiles or corrugated iron, zinc, or tin.

While thatch usage is generally low across all districts, it is more prevalent in rural areas such as Kweneng West, Ngamiland West, Delta and CKGR. Delta relies heavily on thatch and has a notable absence of corrugated iron/zinc/tin roofs. Slate roofing is almost non-existent except in a few districts like Gaborone, Francistown, and Chobe, where it comprises a small percentage. Similarly, concrete usage is minimal across all districts, suggesting limited adoption of these materials for roofing purposes.

Asbestos usage is generally low but slightly more prevalent in urban districts like Selibe Phikwe (10.7%), Orapa (3.7%), Francistown (2.3%), Lobatse (2%) and Jwaneng (1.5%), indicating potential health and safety concerns in those areas.

Materials Used for Building Roof for Household Main House by Locality

The distribution of roofing materials varies significantly across different localities (See table 14). In towns and cities, corrugated iron/zinc/tin is predominant, accounting for 65.9% of roofs, followed by roof tiles at 29.4%. Slate roofs are minimal at 0.8%. Urban villages also show a high prevalence of corrugated iron/zinc/tin (79.1%) and roof tiles (18.2%). However, thatch roofs are more common in urban villages (0.9%) compared to towns and cities (0.2%). In rural areas, corrugated iron/zinc/tin roofs are most prevalent (80.6%), followed by thatch roofs (10.4%).

Notably, the usage of thatch roofs is substantially higher in rural areas compared to urban areas, indicating differences in traditional building practices and availability of materials. Conversely, the prevalence of roof tiles is higher in urban areas, reflecting modern construction trends and infrastructure development.

Conclusion, Policy Implications and Recommendations

Botswana's housing landscape presents a mix of old and new, with preferences varying by location. Over time, there has been a notable shift towards detached houses, which now account for nearly half the population's dwelling choice, particularly in urban areas. This trend is accompanied by an increase in shared accommodations, driven by urban living dynamics. Despite modernization, traditional housing remains significant in rural areas and some districts, reflecting enduring cultural ties. The presence of substandard housing, such as shacks, highlights areas needing attention. The proportion of households with access to houses constructed of nondurable materials stands at 9.3%, still above the target of 5%, indicating ongoing challenges. However, the 2022 Population and Housing Census (PHC) results are encouraging, with 90.7% of households having access to quality housing, surpassing the 2010 Revised National Population Policy (RNPP) target of 90%. This demonstrates significant progress and a positive trend towards improving housing conditions across Botswana.

In Botswana, most people (88.3%) live in housing units for their exclusive use. This preference is strongest in districts like Lobatse and Central Serowe-Palapye (over 90% exclusive use). Shared housing is less common nationwide, but some urban areas like Jwaneng have a higher percentage (35.3%) likely due to social or economic reasons. Even in villages and rural areas, exclusive use dominates (over 89%), although shared housing exists to a small degree. This suggests a preference for private living spaces across most of Botswana.

Construction materials in Botswana reveal a fascinating interplay between tradition and modernization when it comes to building walls. Urban areas prioritize conventional bricks and blocks, reflecting access to resources and modern building practices. Rural regions, however, showcase a richer diversity. They often utilize locally sourced materials, reflecting cultural practices and economic realities. This shift reflects changing construction practices and preferences influenced by factors such as urbanization, economic development, and advancements in building technology. It also highlights how urbanization, and economic factors influence construction choices.

Flooring preferences also vary. Modern materials like cement and floor tiles dominate nationally, suggesting a growing preference for contemporary construction. However, some regions likely retain traditional flooring materials due to cultural influences or economic limitations. This underscores the regional variations in housing standards and preferences.

Similarly, roofing materials showcase a mix of old and new. Corrugated iron/zinc/tin remains dominant across Botswana, especially in rural areas. This reflects its durability and affordability. However, a trend towards more modern roof tiles is emerging, particularly in urban areas. This shift likely stems from socio-economic changes and advancements in construction technology.

In conclusion, Botswana's housing reflects a fascinating mix of old and new. While detached houses rise in popularity, particularly in cities, traditional dwellings persist in rural areas. This interplay extends to construction materials, with urban centres favouring modern options and rural regions utilizing local resources. This highlights how urbanization, access to resources, and cultural traditions all influence housing choices across Botswana.

Policy Implications and Recommendations

We provide policy implications and recommendations for Botswana's evolving housing landscape based on the analysis of housing types, usage, and construction materials. The recommendations consider national development frameworks like TNDP 11, NDP 12, and Vision 2036, alongside international commitments to the SDGs (particularly Goals 1 and 11), Agenda 2063, and human rights instruments.

This analysis reveals a complex housing landscape with a growing demand for detached houses, particularly in urban areas. However, the presence of shared accommodations and traditional housing highlights the need for diverse housing options. Additionally, the use of substandard materials in some areas raises concerns about adequate shelter.

RECOMMENDATIONS:

Targeted Housing Programs: Develop and strengthen targeted housing programs that cater to different needs. This could include affordable housing initiatives for low-income earners, support for shared accommodations in urban centres, and initiatives to improve traditional housing in rural areas while preserving cultural heritage. (Addresses TNDP 11, NDP 12, Vision 2036, SDGs 1 & 11, Agenda 2063)

Safe and Durable Housing: Implement clear regulations and standards for construction materials to ensure safe and durable housing, addressing the presence of substandard housing (shacks). This aligns with Article 11 of the ICESCR. (Addresses TNDP 11, NDP 12, SDGs 11, UN Habitat)

Infrastructure Development: Invest in infrastructure development, particularly in peri-urban areas, to make detached housing developments more sustainable and accessible. (Addresses TNDP 11, NDP 12, Vision 2036, SDGs 11)

Regulation and Standards: Implement clear regulations and standards for construction materials to ensure safe and durable housing, addressing the presence of substandard housing (shacks). (Addresses TNDP 11, NDP 12, SDGs 11, UN Habitat)

Financial Instruments: Explore innovative financial instruments like microloans or mortgage guarantees to facilitate access to financing for homeownership, particularly for low- and middle-income earners. (Addresses TNDP 11, NDP 12, Vision 2036, SDGs 1, UN Habitat, Botswana Housing Policy)

Public-Private Partnerships: Encourage public-private partnerships to leverage resources and expertise for large-scale housing development projects addressing affordability and infrastructure needs. (Addresses TNDP 11, NDP 12, Vision 2036, SDGs 11, UN Habitat)

Data Collection and Analysis: Strengthen data collection and analysis efforts to gain a deeper understanding of evolving housing needs across different demographics and regions. This data will be crucial for informing evidence-based policy decisions. (Addresses TNDP 11, NDP 12, Vision 2036, SDGs 11)

Enacting these suggestions and aligning housing policies with both domestic and global frameworks, Botswana can cultivate a housing environment conducive to sustainable development while upholding human rights principles as articulated in Articles 3 and 11 of the UDHR, and the ICESCR. This endeavour requires ongoing cooperation among government entities, the private sector, and civil society to realize the objectives delineated in Botswana's Housing Policy. By doing so, Botswana can contribute to ensuring access to adequate and secure housing for all, aligning with Agenda 2063 and Sustainable Development Goal 11, and fostering a society where every person can enjoy a dignified place to call home.

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APPENDICES

TABLE 5: Percentage Distribution of Housing Units by Types of Housing and District

CENSUS DISTRICT NAME	TYPE OF HOUSING											TOTAL
	TRADITIONAL	MIXED	DETACHED	SEMI-DETACHED	TOWN HOUSE/ TERRACED	FLATS, APARTMENTS	PART OF COMMERCIAL BUILDING	MOVABLE	SHACK	ROOMS	None	
Gaborone	0.1	1.1	54.4	3.6	3.6	8.8	0.0	0.0	0.3	27.5	0.6	**82,421**
Francistown	0.0	0.7	53.5	3.5	3.9	2.4	0.0	0.0	0.2	35.2	0.6	**33,811**
Lobatse	0.1	2.0	57.9	5.4	1.8	2.7	0.0	0.0	0.4	29.7	0.0	**9,839**
Selibe Phikwe	0.2	1.5	58.9	6.5	4.6	1.9	0.0	0.1	0.2	26.0	0.4	**13,330**
Orapa	0.0	0.1	84.0	8.6	1.5	3.7	0.0	0.0	0.0	2.1	0.0	**3,049**
Jwaneng	0.1	0.7	86.0	7.5	0.2	1.7	0.0	0.3	1.0	2.4	0.1	**6,586**
Sowa	0.0	0.6	95.8	3.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**1,106**
Southern	3.9	21.3	53.8	3.4	0.4	0.3	0.0	0.1	5.1	11.4	0.4	**37,806**
Barolong	3.1	11.3	67.1	2.4	0.2	1.0	0.0	0.1	5.4	9.2	0.2	**16,498**
Ngwaketse West	11.9	27.0	27.1	2.6	0.1	0.0	0.0	0.4	16.7	14.0	0.3	**6,588**
South East	0.6	3.6	57.0	7.3	1.9	2.7	0.0	0.1	1.2	24.7	0.8	**36,327**
Kweneng East	2.2	13.4	46.0	5.8	0.8	1.4	0.0	0.1	1.6	28.1	0.5	**100,751**
Kweneng West	15.3	28.6	31.3	2.1	0.1	1.1	0.0	0.6	14.3	6.0	0.6	**15,920**
Kgatleng (Wards)	1.4	7.5	66.4	2.6	0.9	0.6	0.0	0.2	4.6	15.2	0.7	**36,538**
Central Serowe -Palapye	7.3	21.4	43.2	3.6	0.7	0.2	0.0	0.1	4.1	19.0	0.5	**56,992**
Central Mahalapye	8.7	23.6	45.8	2.8	0.5	0.2	0.0	0.2	3.7	14.3	0.3	**36,683**
Central Bobonong	10.1	21.2	48.8	3.0	0.2	0.5	0.0	0.3	1.5	13.8	0.5	**22,212**
Central Boteti	14.8	24.1	27.8	4.7	0.8	0.1	0.0	0.2	3.2	23.4	0.9	**21,259**
Central Tutume	10.9	31.6	39.4	2.5	0.2	0.5	0.0	0.1	1.2	13.1	0.5	**46,626**
North-East	1.6	28.6	48.1	4.1	0.4	0.6	0.0	0.1	0.8	15.3	0.5	**20,912**
Ngamiland East	10.0	16.3	36.4	3.5	1.4	0.8	0.0	0.4	2.2	27.7	1.3	**31,591**
Ngamiland West	33.9	33.1	18.6	3.5	0.2	0.7	0.0	0.2	0.4	9.0	0.4	**17,921**
Chobe	2.5	8.8	33.1	4.5	1.9	1.1	0.2	1.3	3.2	42.7	0.7	**10,124**
Delta	91.7	4.7	1.0	0.0	0.0	0.0	0.0	1.6	0.5	0.0	0.5	**192**
Ghanzi	11.6	17.3	34.0	3.2	0.8	0.3	0.1	0.7	9.6	21.1	1.2	**15,158**
CKGR	88.1	0.0	10.7	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	**84**
Kgalagadi South	9.9	14.3	49.7	4.3	0.1	0.6	0.0	0.7	5.3	15.0	0.2	**9,749**
Kgalagadi North	7.9	10.0	50.8	5.1	0.1	0.3	0.0	0.5	7.2	17.8	0.3	**7,172**
TOTAL	**5.7**	**14.8**	**47.9**	**4.0**	**1.3**	**1.9**	**0.0**	**0.2**	**2.8**	**20.9**	**0.6**	**697,245**

TABLE 6: Percentage Distribution Of Housing Units By Types Of Housing And Locality

LOCALITY	TYPE OF HOUSING											TOTAL
	TRADITIONAL	MIXED	DETACHED	SEMI-DETACHED	TOWN HOUSE/ TERRACED	FLATS, APARTMENTS	PART OF COMMERCIAL BUILDING	MOVABLE	SHACK	ROOMS	NONE	
TOWNS AND CITIES	0.1	1.0	57.1	4.2	3.4	5.9	0.0	0.0	0.3	27.4	0.5	**150,142**
URBAN VILLAGES	0.9	12.0	53.8	5.3	1.0	1.2	0.0	0.1	0.4	24.8	0.6	**307,268**
RURAL AREAS	15.3	27.2	34.4	2.3	0.3	0.2	0.0	0.4	7.4	11.9	0.6	**239,835**
TOTAL	**5.7**	**14.8**	**47.9**	**4.0**	**1.3**	**1.9**	**0.0**	**0.2**	**2.8**	**20.9**	**0.6**	**697,245**

TABLE 7: Percentage Distribution of Housing Units by Housing Unit Use and District

CENSUS DISTRICT NAME	HOUSING UNIT USE			TOTAL HOUSEHOLDS
	EXCLUSIVE USE	SHARED	NO HOUSING	
Gaborone	83.4	16.0	0.6	**82,421**
Francistown	82.1	17.3	0.6	**33,811**
Lobatse	90.0	10.0	0.0	**9,839**
Selibe Phikwe	88.6	11.0	0.4	**13,330**
Orapa	86.2	13.8	0.0	**3,049**
Jwaneng	64.6	35.3	0.1	**6,586**
Sowa	79.7	20.3	0.0	**1,106**
Southern	87.0	12.6	0.4	**37,806**
Barolong	92.5	7.2	0.2	**16,498**
Ngwaketse West	86.7	13.0	0.3	**6,588**
South East	88.7	10.5	0.8	**36,327**
Kweneng East	88.0	11.5	0.5	**100,751**
Kweneng West	86.7	12.7	0.6	**15,920**
Kgatleng (Wards)	92.2	7.1	0.7	**36,538**
Central Serowe -Palapye	91.7	7.8	0.5	**56,992**
Central Mahalapye	93.1	6.6	0.3	**36,683**
Central Bobonong	94.7	4.8	0.5	**22,212**
Central Boteti	89.3	9.8	0.9	**21,259**
Central Tutume	90.1	9.3	0.5	**46,626**
North East	92.8	6.6	0.5	**20,912**
Ngamiland East	88.0	10.7	1.3	**31,591**
Ngamiland West	84.3	15.3	0.4	**17,921**
Chobe	88.6	10.7	0.7	**10,124**
Delta	82.8	16.7	0.5	**192**
Ghanzi	86.5	12.3	1.2	**15,158**
CKGR	96.4	3.6	0.0	**84**
Kgalagadi South	92.2	7.7	0.2	**9,749**
Kgalagadi North	92.0	7.7	0.3	**7,172**
TOTAL	**88.3**	**11.1**	**0.6**	**697,245**

TABLE 8: Percentage Distribution of Housing Units by Housing Unit Use and Locality

LOCALITY	HOUSING UNIT USE			TOTAL HOUSEHOLDS
	EXCLUSIVE USE	SHARED	NO HOUSING	
Towns and Cities	83.2	16.3	0.5	**150,142**
Urban Villages	89.8	9.6	0.6	**307,268**
Rural Areas	89.6	9.8	0.6	**239,835**
TOTAL HOUSEHOLDS	**88.3**	**11.1**	**0.6**	**697,245**

TABLE 9: Percentage Distribution of Households by type of Materials Used for Building Walls for Household Main House by District

CENSUS DISTRICT NAME	TYPE OF MATERIALS USED FOR BUILDING WALLS										TOTAL
	CONVECTIONAL BRICKS/ BLOCKS	MUD BRICKS/ BLOCKS	MUD & POLES/ COW-DUNG/ THATCH/ REEDS/ BOTTLES	POLES & REEDS	CORRUGATED IRON/ ZINC/TIN	ASBESTOS	WOOD	STONE	OTHER	NO HOUSING	
Gaborone	96.1	2.1	0.0	0.0	0.9	0.1	0.0	0.0	0.2	0.6	**82,421**
Francistown	94.1	4.5	0.0	0.0	0.5	0.1	0.0	0.0	0.2	0.6	**33,811**
Lobatse	95.9	2.3	0.0	0.0	0.5	0.3	0.0	0.0	0.9	0.0	**9,839**
Selibe Phikwe	97.5	0.9	0.2	0.0	0.4	0.2	0.0	0.0	0.5	0.4	**13,330**
Orapa	96.3	0.1	0.1	0.0	0.9	0.8	0.1	0.0	1.8	0.0	**3,049**
Jwaneng	97.0	0.3	0.0	0.0	1.8	0.7	0.0	0.0	0.1	0.1	**6,586**
Sowa	99.4	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	**1,106**
Southern	86.5	5.2	1.2	0.1	6.1	0.1	0.1	0.0	0.2	0.4	**37,806**
Barolong	87.8	4.1	1.6	0.0	5.5	0.0	0.2	0.1	0.3	0.2	**16,498**
Ngwaketse West	64.3	7.7	6.6	0.7	18.3	0.7	0.5	0.0	1.0	0.3	**6,588**
South East	94.4	2.6	0.3	0.0	1.4	0.1	0.1	0.1	0.1	0.8	**36,327**
Kweneng East	92.2	3.9	0.6	0.1	2.2	0.2	0.1	0.0	0.1	0.5	**100,751**
Kweneng West	63.2	9.3	6.2	1.2	16.0	0.4	2.4	0.3	0.5	0.6	**15,920**
Kgatleng (Wards)	89.5	4.0	0.4	0.1	5.0	0.1	0.2	0.0	0.1	0.7	**36,538**
Central Serowe -Palapye	83.4	8.2	2.1	0.1	4.9	0.1	0.2	0.0	0.5	0.5	**56,992**
Central Mahalapye	84.1	8.5	2.0	0.1	4.7	0.1	0.1	0.0	0.2	0.3	**36,683**
Central Bobonong	83.5	11.3	2.3	0.1	1.8	0.1	0.1	0.0	0.3	0.5	**22,212**
Central Boteti	74.1	13.3	6.4	0.6	3.9	0.1	0.3	0.1	0.4	0.9	**21,259**
Central Tutume	82.4	11.2	3.7	0.1	1.7	0.0	0.1	0.0	0.2	0.5	**46,626**
North East	93.7	3.9	0.3	0.0	1.4	0.0	0.0	0.0	0.1	0.5	**20,912**
Ngamiland East	79.5	8.5	6.4	0.3	2.8	0.1	0.3	0.1	0.8	1.3	**31,591**
Ngamiland West	58.2	13.2	21.3	4.3	1.4	0.1	0.3	0.0	0.7	0.4	**17,921**
Chobe	86.4	4.2	1.8	0.4	3.1	1.1	0.9	0.0	1.2	0.7	**10,124**
Delta	2.6	30.7	57.8	4.7	1.6	1.0	0.5	0.0	0.5	0.5	**192**
Ghanzi	67.8	6.0	12.3	0.3	10.0	0.4	0.4	0.2	1.4	1.2	**15,158**
CKGR	10.7	0.0	88.1	0.0	0.0	0.0	0.0	0.0	1.2	0.0	**84**
Kgalagadi South	78.3	6.2	8.9	0.2	5.1	0.2	0.1	0.1	0.7	0.2	**9,749**
Kgalagadi North	82.2	2.9	7.2	0.1	6.1	0.1	0.4	0.0	0.6	0.3	**7,172**
TOTAL	**86.6**	**5.9**	**2.6**	**0.2**	**3.4**	**0.1**	**0.2**	**0.0**	**0.3**	**0.6**	**697,245**

TABLE 10: Percentage Distribution of Households by type of Materials Used for Building Walls for Household Main House by Locality

CENSUS DISTRICT NAME	TYPE OF MATERIALS USED FOR BUILDING WALLS									No Housing	TOTAL
	Convectional Bricks/ Blocks	Mud Bricks/ Blocks	Mud & Poles/ Cow-dung/ Thatch/ Reeds/ Bottles	Poles & Reeds	Corrugated Iron/Zinc/ Tin	Asbestos	Wood	Stone	Other		
Towns and Cities	95.8	2.4	0.0	0.0	0.7	0.2	0.0	0.0	0.3	0.5	**150,142**
Urban Villages	95.1	2.8	0.4	0.0	0.8	0.1	0.1	0.0	0.1	0.6	**307,268**
Rural Areas	70.1	12.0	7.0	0.7	8.2	0.2	0.5	0.1	0.6	0.6	**239,835**
TOTAL HOUSEHOLDS	**86.6**	**5.9**	**2.6**	**0.2**	**3.4**	**0.1**	**0.2**	**0.0**	**0.3**	**0.6**	**697,245**

TABLE 11 : Percentage Distribution of Households by type of Materials Used for Floor for Household Main House by District

DISTRICT NAME	TYPE OF MATERIALS USED FOR BUILDING FLOORS								NO HOUSING	TOTAL
	CEMENT	FLOOR TILES	MUD	MUD/ DUNG	WOOD	BRICK/ STONES	NONE	OTHER		
Gaborone	39.4	59.5	0.1	0.0	0.1	0.1	0.1	0.2	0.6	**82,421**
Francistown	57.6	41.4	0.1	0.1	0.0	0.0	0.1	0.1	0.6	**33,811**
Lobatse	66.6	33.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	**9,839**
Selibe Phikwe	63.9	35.3	0.1	0.1	0.1	0.1	0.1	0.0	0.4	**13,330**
Orapa	2.2	95.8	0.0	0.0	0.5	0.0	0.0	1.4	0.0	**3,049**
Jwaneng	29.0	70.1	0.1	0.0	0.0	0.0	0.4	0.2	0.1	**6,586**
Sowa	67.2	32.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	**1,106**
Southern	63.8	28.9	2.7	1.8	0.1	0.1	2.0	0.3	0.4	**37,806**
Barolong	68.4	25.8	1.7	1.4	0.1	0.2	1.7	0.4	0.2	**16,498**
Ngwaketse West	62.4	14.7	8.2	3.1	0.3	0.3	9.0	1.7	0.3	**6,588**
South East	47.3	50.6	0.4	0.3	0.1	0.1	0.2	0.1	0.8	**36,327**
Kweneng East	59.6	36.5	1.5	0.9	0.1	0.1	0.6	0.1	0.5	**100,751**
Kweneng West	59.8	14.4	8.5	4.6	0.6	0.3	10.4	0.7	0.6	**15,920**
Kgatleng (Wards)	58.6	37.2	1.3	0.5	0.1	0.1	1.4	0.1	0.7	**36,538**
Central Serowe -Palapye	60.7	28.6	5.7	2.9	0.1	0.1	1.1	0.2	0.5	**56,992**
Central Mahalapye	67.0	23.0	5.8	2.3	0.1	0.1	1.4	0.2	0.3	**36,683**
Central Bobonong	65.9	24.0	5.3	3.8	0.1	0.0	0.3	0.2	0.5	**22,212**
Central Boteti	55.3	26.0	8.5	5.7	0.1	0.1	2.9	0.5	0.9	**21,259**
Central Tutume	63.2	25.1	7.1	3.3	0.1	0.1	0.5	0.1	0.5	**46,626**
North East	61.9	35.7	1.3	0.3	0.0	0.1	0.1	0.1	0.5	**20,912**
Ngamiland East	55.2	30.4	5.8	4.1	0.2	0.1	2.1	0.8	1.3	**31,591**
Ngamiland West	55.2	14.4	16.3	7.5	0.2	0.1	5.1	0.6	0.4	**17,921**
Chobe	62.7	30.2	1.6	1.1	0.9	0.1	2.0	0.7	0.7	**10,124**
Delta	5.7	0.0	50.5	39.6	1.0	0.5	2.1	0.0	0.5	**192**
Ghanzi	54.2	27.3	3.4	2.1	0.1	0.3	10.2	1.2	1.2	**15,158**
CKGR	0.0	10.7	0.0	0.0	1.2	0.0	51.2	36.9	0.0	**84**
Kgalagadi South	63.2	25.3	3.0	2.4	0.1	0.2	4.7	0.9	0.2	**9,749**
Kgalagadi North	60.0	28.2	2.2	2.1	0.3	0.1	5.9	1.0	0.3	**7,172**
TOTAL	**57.0**	**35.1**	**3.4**	**1.8**	**0.1**	**0.1**	**1.6**	**0.3**	**0.6**	**697,245**

TABLE 12: Percentage Distribution of Households by type of Materials Used for Floors for Household Main House by Locality

LOCALITY	TYPE OF MATERIALS USED FOR BUILDING FLOORS								NO HOUSING	TOTAL
	CEMENT	FLOOR TILES	MUD	MUD/ DUNG	WOOD	BRICK/ STONES	NONE	OTHER		
Towns and Cities	46.4	52.6	0.1	0.0	0.1	0.1	0.1	0.2	0.5	**150,142**
Urban Villages	57.1	41.1	0.6	0.2	0.1	0.1	0.2	0.1	0.6	**307,268**
Rural Areas	63.6	16.5	9.0	5.1	0.3	0.2	4.2	0.6	0.6	**239,835**
TOTAL HOUSEHOLDS	**57.0**	**35.1**	**3.4**	**1.8**	**0.1**	**0.1**	**1.6**	**0.3**	**0.6**	**697,245**

TABLE 13: Percentage Distribution of Households by type of Materials Used for Roof for Household Main House by District

CENSUS DISTRICT NAME	TYPE OF MATERIALS USED FOR ROOF							NO HOUSING	TOTAL
	SLATE	THATCH	ROOF TILES	CORRUGATED IRON/ ZINC/ TIN	ASBESTOS	CONCRETE	OTHER		
Gaborone	0.9	0.3	38.0	57.9	0.9	1.0	0.6	0.6	**82,421**
Francistown	0.9	0.2	19.6	76.2	2.3	0.2	0.0	0.6	**33,811**
Lobatse	1.0	0.0	16.2	80.1	2.0	0.4	0.3	0.0	**9,839**
Selibe Phikwe	0.3	0.1	13.0	75.3	10.7	0.2	0.0	0.4	**13,330**
Orapa	0.0	0.0	26.5	68.2	3.7	1.5	0.1	0.0	**3,049**
Jwaneng	0.3	0.1	30.2	67.7	1.5	0.1	0.1	0.1	**6,586**
Sowa	0.2	0.0	12.2	87.5	0.1	0.0	0.0	0.0	**1,106**
Southern	0.5	2.6	14.7	81.0	0.4	0.1	0.2	0.4	**37,806**
Barolong	0.5	2.5	11.2	85.2	0.0	0.0	0.3	0.2	**16,498**
Ngwaketse West	2.0	6.3	4.3	86.2	0.1	0.0	0.9	0.3	**6,588**
South East	1.2	1.0	27.6	69.0	0.1	0.3	0.1	0.8	**36,327**
Kweneng East	0.7	2.5	16.2	79.6	0.1	0.2	0.2	0.5	**100,751**
Kweneng West	0.8	15.1	5.1	77.7	0.1	0.1	0.6	0.6	**15,920**
Kgatleng (Wards)	0.9	0.5	18.2	79.3	0.1	0.2	0.1	0.7	**36,538**
Central Serowe -Palapye	0.5	5.5	14.5	78.5	0.1	0.1	0.3	0.5	**56,992**
Central Mahalapye	0.3	5.9	12.2	80.6	0.3	0.1	0.3	0.3	**36,683**
Central Bobonong	0.2	3.5	12.2	83.1	0.2	0.1	0.2	0.5	**22,212**
Central Boteti	0.9	8.9	8.1	80.3	0.1	0.1	0.6	0.9	**21,259**
Central Tutume	0.3	9.0	11.0	78.6	0.1	0.2	0.2	0.5	**46,626**
North East	0.2	1.5	15.5	82.0	0.1	0.0	0.1	0.5	**20,912**
Ngamiland East	0.8	3.9	6.7	86.0	0.3	0.3	0.6	1.3	**31,591**
Ngamiland West	0.3	30.5	1.9	65.3	0.1	0.2	1.4	0.4	**17,921**
Chobe	2.2	2.2	5.6	87.4	0.9	0.1	0.8	0.7	**10,124**
Delta	0.0	89.6	0.0	8.3	1.0	0.0	0.5	0.5	**192**
Ghanzi	0.2	2.8	6.3	87.5	0.1	0.1	1.8	1.2	**15,158**
CKGR	0.0	88.1	9.5	1.2	0.0	0.0	1.2	0.0	**84**
Kgalagadi South	0.3	2.2	6.6	89.3	0.7	0.0	0.6	0.2	**9,749**
Kgalagadi North	0.2	2.4	11.2	85.2	0.2	0.0	0.6	0.3	**7172**
TOTAL	**0.7**	**4.0**	**16.7**	**76.8**	**0.6**	**0.3**	**0.4**	**0.6**	**697,245**

TABLE 14: Percentage Distribution of Households by type of Materials Used for Roof for Household Main House by Locality

LOCALITY	TYPE OF MATERIALS USED FOR ROOF							NO HOUSING	TOTAL
	SLATE	THATCH	ROOF TILES	CORRUGATED IRON/ ZINC/ TIN	ASBESTOS	CONCRETE	OTHER		
Towns and Cities	0.8	0.2	29.4	65.9	2.2	0.7	0.3	0.5	**150,142**
Urban Villages	0.7	0.9	18.2	79.1	0.2	0.2	0.1	0.6	**307,268**
Rural Areas	0.5	10.4	7.0	80.6	0.2	0.1	0.7	0.6	**239,835**
TOTAL HOUSEHOLDS	**0.7**	**4.0**	**16.7**	**76.8**	**0.6**	**0.3**	**0.4**	**0.6**	**697,245**

Exploring Differentials in Access to Quality Housing for the Vulnerable in Botswana: An Analysis of Housing Conditions and Sustainability

Ms Amutshilani M Setoboli[1], Dr Mutakela K. Minyoi[2], Dr Mpho Keetile[3], Dr Serai Daniel Rakgoasi[4]

Introduction

According to UN-HABITAT, (2015), housing is central to human development as it directly affects the enjoyment of other prerequisites of life like well-being, dignity, quality of life, security, health, and education. Housing is more than just a physical structure, but also includes basic services and social facilities essential to support the human habitat (Olanrewaju, et al, 2021). For housing to be inclusive, it should not only be adequate and affordable but also fulfill the economic, social, and environmental needs of all people irrespective of their background, ethnicity, race, gender, age, and geographical location (Amado et al, 2017; Peck, 2020).

On the other hand, sustainable housing is defined as housing that "meets the needs and demands of the present generation without compromising the ability of future generations to meet their housing needs and demands" (Adabre and Chan, 2019: 204). This recognizes the critical role housing plays in the triad of sustainable development: economic development, social equity, and environmental protection (Turcotte and Geiser, 2010). Choguill (2007) offers a succinct definition of sustainable housing as "housing that is economically viable, socially acceptable, technically feasible, and environmentally compatible." Based on this understanding, a participatory housing process is a prerequisite to inclusive and sustainable housing and basic services (Ibem and Adawo, 2015).

Given that housing is the most expensive basic need a person can acquire, vulnerable people are severely marginalized and disproportionately affected by limited access to housing due to inadequate financial means, poverty, and isolation. Considering the critical role housing plays in driving human development, it must be accessible to all, to reduce inequalities and foster meaningful participation of the vulnerable. However, accessing housing remains an immensely difficult feat for vulnerable people.

Vulnerable populations refer to the sections of society whose characteristics put them at a higher risk of exclusion from accessing basic services and living in poverty than others (Kuran et al, 2020). These population groups include; the elderly, youth, People with Disabilities (PWDs), women, female-headed households, minority groups, child-headed households, people living with HIV/AIDS, displaced persons, undocumented migrants as well as Remote Area Dwellers (RADs). Due to inherent economic, social, political, religious, and cultural factors, opportunities available to vulnerable people are limited, effectively trapping them in poverty. This fuels the development of informal, substandard housing and overcrowding, which not only places excessive pressure on existing infrastructure and basic services but also compromises well-being and the environment.

The analysis in this paper uses census data to determine the extent to which vulnerable people have access to sustainable housing. It focuses on PWDs, the elderly, and female-headed households, and makes a comparison between urban and rural households. Information obtained from this study is anticipated to inform policy on the nature and severity of housing deprivations faced by vulnerable people. This is particularly important since there is a dearth of information on the housing needs of vulnerable populations and no policy framework specifically targeting different housing vulnerabilities.

Objectives

This paper seeks to achieve the following:

- Critically assess housing conditions for the elderly, PWDs, and female-headed households to determine if they are inclusive and sustainable
- Assess socio-economic characteristics to determine their role in access to housing
- Undertake a geographical analysis to determine differential access to housing between urban and rural settings
- Propose policy recommendations for inclusive and sustainable housing

Literature review

In recognition of the important role housing plays in human development, it is recognised as a human right, entrenched in the Declaration of Human Rights of 1948 and main development agendas such as Agenda 21 for Sustainable Development, and Millennium Development Goals. These documents stress the need for equitable access to housing by vulnerable populations and adherence to the tenets of sustainable development (Mbatha, 2018). In addition, inclusive, and sustainable housing resonates with the key principle of Agenda 2030 for Sustainable Development, 'leave no one behind' and Agenda 2063 which envisions a "modern and livable habitat and quality basic services". Similarly, Vision 2036 recognises the important role housing plays in alleviating poverty, fostering shared prosperity, and human settlements that are 'socially inclusive, environmentally friendly and economically vibrant'. (Presidential Task Team, 2016).

These development agendas were adopted against the backdrop of rapid urbanisation, which exceeds the capacity of national and local governments to deliver housing to all persons, particularly vulnerable groups, thereby fueling pervasive housing deprivations, particularly in the Global South (Jones, 2016). Empirical data suggests that these deprivations have systemic effects that transcend generations, thereby locking vulnerable people in a web of exclusion (Wachter et al, 2018). This underscores the central role housing plays in building inclusive and sustainable communities.

According to Amado et al, (2017), the key indicators of inclusive housing include affordability, durability, access to potable water, improved sanitation, public transport, and clean energy. Inclusive housing also encompasses the universal design of housing to cater for people with mobility challenges (Lakhani et al, 2019). Furthermore, the housing process must be participatory to ensure context-appropriate housing that is in keeping with local lifestyles. Similarly, sustainable housing goes beyond being inclusive to ensuring that housing supports household economies and environmental preservation. Accordingly, factors such as densification, the greening of neighbourhoods, use of environmentally friendly and affordable materials, energy and water efficiency of residential buildings, and the location of housing in proximity to jobs, shops, health, and educational facilities, are key elements of sustainable housing (Rerat, 2012; Golubchikov and Badyina, (2012:9).

In light of the limitations posed by quantitative census data in providing insights into social, cultural, and location factors, this analysis will only focus on parameters with available data sets. These include habitability (wall, floors, and roof), sufficient living space, housing tenure, access to potable water, improved sanitation, clean energy, solid waste, security of tenure, age, sex, disability, household headship, and place of residence and ethnicity.

Research Methodology

Descriptive statistical methods were used to analyze the census data. The results are presented in tables, graphs, and charts. Additionally, multivariate analysis was done to determine the correlation between housing conditions and socio-economic factors. **Table 1** outlines some of the indicators relevant and useful for analyzing access to housing for vulnerable people in Botswana.

TABLE 1: Summary of housing indicators

HOUSING		
INDICATORS	**CENSUS DATA**	**RELEVANCE**
% of vulnerable people living in decent housing	Materials used for roofs, walls, and floors.	Measures the quality of housing.
% of vulnerable people with security of tenure	Possession of a certificate or title deed	Measures legal protection from eviction and stability
Disaggregation of housing criteria according to age	Age	Determines if age contributes to housing vulnerability
Disaggregation of housing criteria according to sex	Sex	Determines if sex is a contributory factor
Disaggregation of housing criteria according to geographical location	Place of residence	Measures if there is spatially exclusionary access to housing by vulnerable people

Results

The section below presents results relating to the quality of housing; access to land for housing, sources of water and energy; and access to sanitation. (Please refer to Appendix 1 for detailed statistics on access to housing)

Quality of Housing

Housing quality was measured by an indicator variable based on responses to questions on the types of materials for the construction of the house floor, walls, and roof. Responses to questions were then collated into an indicator variable that classified the housing unit as either being "good" quality or "bad" quality **(Refer to Appendix 2 for classification of variables).** The results show that overall, a large proportion of dwelling units were constructed using good quality, durable materials. For example, over nine in ten households resided in housing units that were made of good-quality walls (87.1%); good quality floor materials (92.7%), and roof (94.0%). Conversely stated, the proportion of bad-quality housing units was significantly higher in rural areas, where close to a third of all rural households (29.5%) resided in bad-quality housing units compared to households in urban areas (3.7%) and households in urban villages (4.4%).

The proportion of housing units whose walls were made of good materials varied by region and was highest in urban areas (96.3%) and urban villages (95.6%) and is lowest among households residing in rural areas (70.5%). Similar variations by region are also observed in results relating to the quality of floor and roof materials. For example, the proportion of households whose floor materials are of good quality is highest in both urban (99.5%), and urban villages (98.9%) and is high even among rural households (80.6%). Similarly, the proportion of housing units with good quality roof materials is also high in urban areas (95.8%), and urban villages (97.8%), and high in rural areas (88.1%).

To determine the overall quality of the housing unit, responses to questions on the type of materials for construction of the house floor, walls, and roof were then used to derive an overall index of quality of housing. The results show that close to nine out of every ten (84.7%) dwelling units were good quality. Conversely stated, just under a fifth (15.3%) of dwellings were neither of good quality, with less than a tenth of households being classified as fair (7.6%) or just over a twentieth being classified as being of poor (4.5%) quality. 10.7% of PWDs housing is poor, while 10.9% of the elderly are also classified as poor. In addition, 9% of male-headed households live in poor housing quality compared to 6.1% in female-headed households.

Adequacy of Living Space

The number of rooms in relation to household size measures the sufficiency of living space. The UN-HABITAT uses a standard of no more than three people sharing a room to determine adequacy, with households that have higher numbers of people sharing a room being considered to be living in overcrowded conditions.

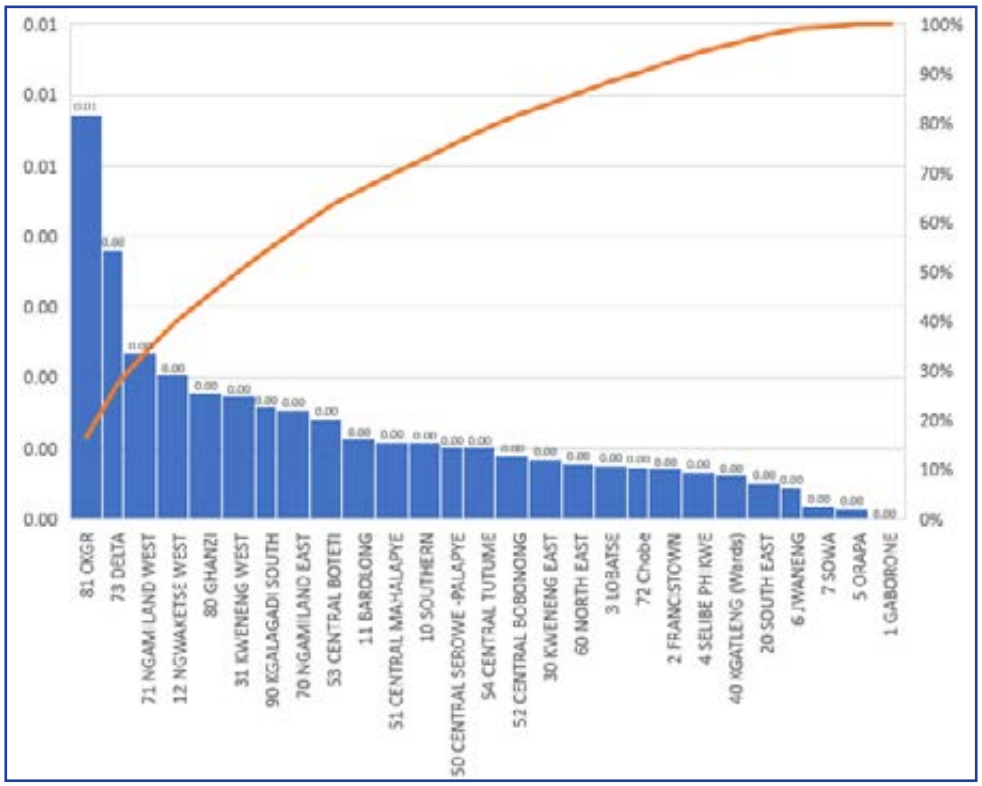
As **table 2** below shows, close to half (48%) of households had a ratio of less than one person to one person per room; close to a third (28.7%) had a ratio of one to two people per room, while just over a tenth (12.8%) has a ratio of two to three people per room. Overall, a tenth of households (10.3%) had over three people per room.

TABLE 2: Number of people per room

	No. of Households	Percentage of households
1 person per room	288,402	48.2
2 people per room	171,631	28.7
3 people per room	76,788	12.8
4 people per room	32,343	5.4
5 people per room	14,369	2.4
6 people per room	6,612	1.1
7 people per room	8,136	1.4
TOTAL	**598,281**	**100.0**

Figure 1 shows the index of overcrowding by district and a corresponding pareto curve showing the incremental contribution of each district to crowding. It shows that the first six districts in the chart contribute to over 60 percent of the crowding measured. These are mostly rural and often remote districts.

FIGURE 1: Crowding by District



Further analysis was done on households that occupy one room to determine the level and patterns of overcrowding among one-room dwellers. An average of 33.5% of households in Botswana live in 1 room, with urban areas being most affected at 37.2. Approximately half (46.7%) of one-room households had between zero to one person per room, just over a fifth (22,1%) had between one and two people per room, while just over one-tenth (12.9%) had two to three people per room. Overall, just under a fifth of one-room households (18.4%) had three or more people per room. The analysis further indicates that male-headed households are more likely to stay in 1 roomed houses than females as evidenced by 37.7% compared to 28.2% in females. In addition, 14.4% and 26.3% of the elderly and PWDs live in 1 roomed houses respectively.

Although results indicate that only 18.4% of households occupying one-roomed houses live in overcrowded conditions, it is worth noting that, generally, such houses are considered to be having insufficient living space. This is due to the fact that the rooms are mostly used for multiple purposes- a kitchen, a bathroom, and a bedroom, which compromises comfort and hygiene.

Access to Bathroom facilities

Bathroom availability is an important measure of adequacy of living space and quality of life. Generally, access to bathroom facilities is higher in urban areas, with approximately 7 in 10 households having access. Rural areas have the lowest access at 32.5%. Both the elderly and the PWDs have approximately 46% access to bathrooms. There is no notable difference between male and female-headed households' access to the bathroom at 50.4 and 52.7% respectively.

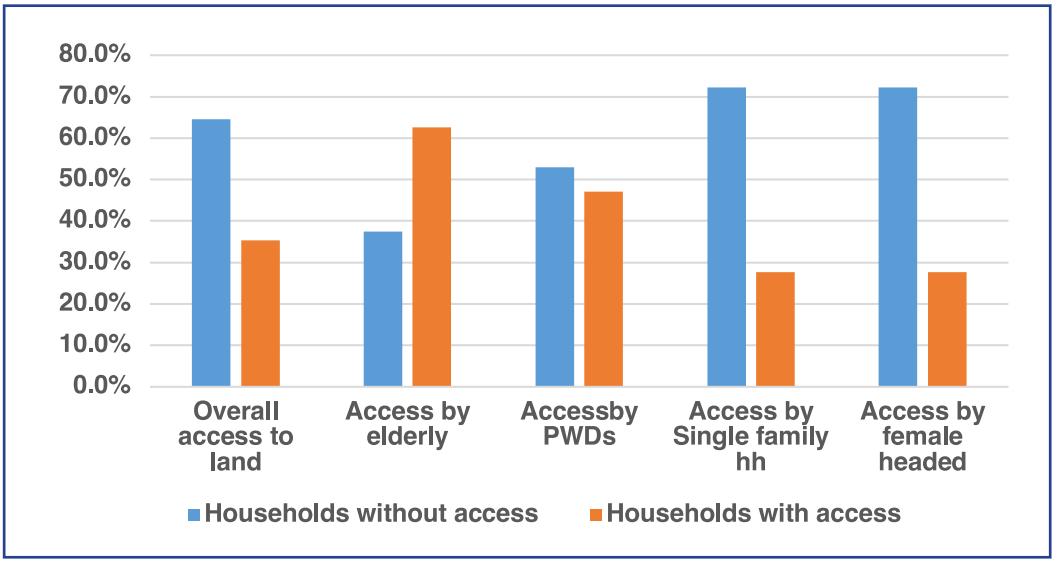
Access to Kitchen

Similar to bathroom facilities, kitchens determine the adequacy of living space. The separation of cooking and sleeping facilities is not only important for hygiene but also safety. Over two-thirds (67.8) of households in Botswana have kitchens. A large proportion (77.1%) of these households are found in urban areas while 52.9% are in rural villages. Over two-thirds of the elderly and the disabled have access to kitchens. It was further noted that female-headed households have greater access to kitchens (70.2%) than male-headed households (66%). These results indicate that vulnerable households' access to kitchens is not too different from the national average, indicating equitable access.

Access to land for housing

The results show that just over a third (35.4%) of households own the land on which their housing or dwelling unit resided. This proportion increases from just over a fifth (21.9%) among households in urban areas, to less than a third (30.1%) among households in urban villages and half (50.7%) among households in rural areas.

FIGURE 2: Percentage of households with access to land for housing



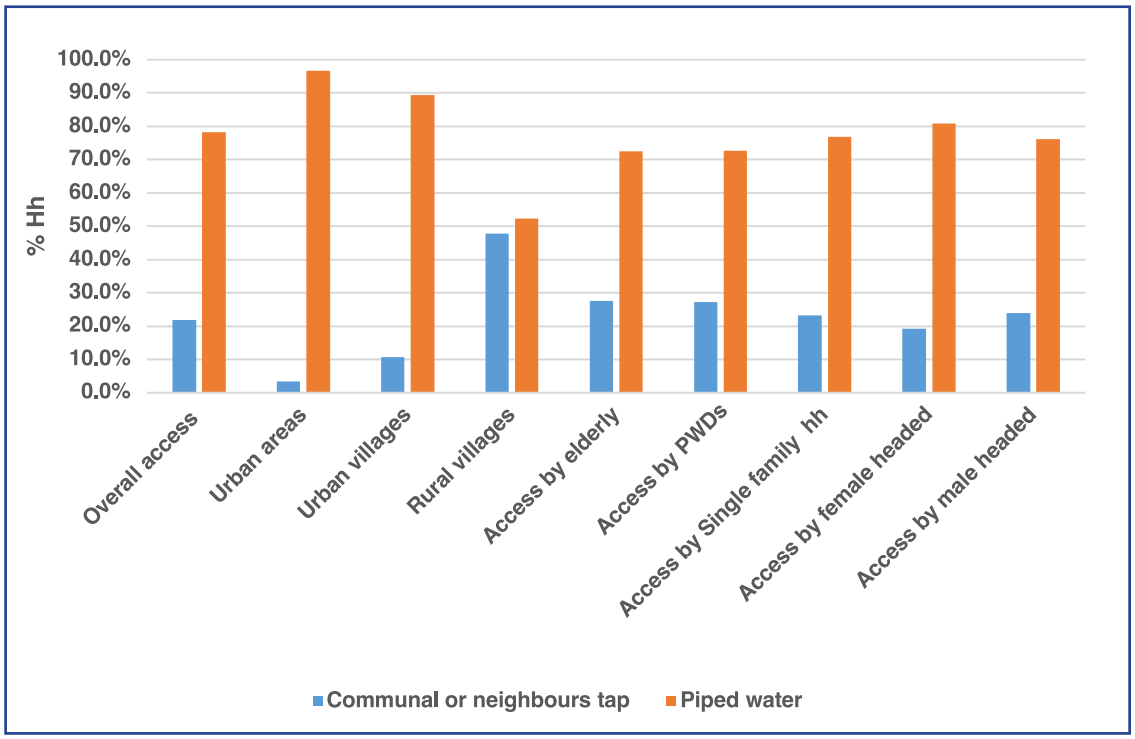
Overall, six out of every ten households (59.8%) of households' land for housing was acquired through land boards; just under a third (30.2%) of households acquired housing land through tribal allocations, inheritance, and relatives; slightly over one in twenty (5.8%) households either purchased or leased their housing land, while 4.1 percent of households' housing land was acquired through self-allocation or other related means.

Tribal land constitutes the predominant land tenure under which residential land is held by most households. The results show that tribal land accounts for 82.7 percent of household land for housing; followed by freehold land (13.3%) and state land (4.0). The proportion of households on tribal land tenure increases from 76.9

percent among urban households to 81.3 percent and 85.4 percent among households in urban villages and rural areas, respectively. The elderly people's access to land is 62.6%, compared to 47.1% of PWDs'. There is equal access to land for both male and female-headed households at 33.5% and 33% respectively.

Household sources of drinking water

FIGURE 3: Percentage of Households with access to water



This section presents results relating to household sources of water for drinking and other purposes other than drinking. It focused on how water is delivered to the household. Over three-quarters (78.4%) of all households' drinking water is piped, either indoors or within the yard. This leaves over a fifth (21.6%) of households without piped drinking water within the yard and who depend on the neighbours or communal standpipes. The proportion of households with piped drinking water is significantly higher among households residing in urban areas (97.1%) and urban villages (89.6%) and is significantly lower among households residing in rural areas, where just over half (52.4%) have access to piped water. Furthermore, 81.1% of female-headed households have access to piped water compared to 73.6% in male-headed households. The results also show that out of every ten households (84.7%) was sourced from the Water Utilities Corporation. Households without access to piped water source water from communal taps, which, while not as convenient as piped water, are safe for drinking.

Household sources of water for other use other than drinking

The results also show that over three quarters (78.2%) obtain water for other purposes rather than drinking, from water that is piped either in the yard or within the household; and in almost nine out of every ten households (84.7%) source their water from the Water Utilities Corporation (WUC). There is however evidence of differential access according to geographical locations, with 96.7% of urban households using piped water in the house or yard, compared to 89.3% in urban villages. The disparity is even more prominent in rural villages, whose access is only 52.3%. 72.5% of the elderly have access to piped water, compared to 73.1% of PWDs. Similarly, there is no marked difference in access between male and female-headed households, whose access to piped water is 76.3% and 81.1% respectively.

Households' source of energy

Households' source of energy for cooking, lighting, and heating are key considerations in determining the adequacy of housing. Thus, in addition to assessing the quality of materials for the construction of the household dwelling unit, the analysis also encompassed an assessment of household sources of energy. These sources were classified in terms of clean, modern, and sustainable forms of energy, such as electricity, including solar, and were assessed in terms of access to clean and modern sources of energy for lighting, cooking, and heating.

Sources of energy for lighting

Approximately three-quarters (73.4%) of households use national grid electricity for lighting, while just under a tenth (9.0%) use off-grid electricity. Thus overall, 82.4 percent of households were using electricity for lighting. This proportion is highest among urban households (92.8%); followed by (91.3%) and is lowest among households in rural areas, with less than two-thirds (64.6%) of rural households. 75.2% of the elderly have access to electricity, compared to 76.3% of PWDs. Similarly, there is not much disparity in access to electricity between males and females, who have 82.3% and 82.7% access respectively. It should however be noted that access to renewable sources of sources of electricity is low as evidenced by 9% of households using off-grid, including solar.

Sources of energy for cooking

The most prominent sources of household energy for cooking are gas, wood, coal, and paraffin; electricity is the least used. For example, while just over a quarter (26.2%) of all households use electricity (national grid and off-grid) close to three-quarters (73.9%) of households use gas, paraffin, coal, and wood for cooking.

While just over a quarter (26.2%) of all households use electricity for cooking, this proportion is higher among urban households (33.2%) and urban village households (31.1%) than rural households (12.8%). While the use of gas, paraffin, coal, and wood was higher among rural households (86.5%) than urban (65.9%) or urban village households (67.9%) the difference in use of gas, paraffin, coal, wood, between urban, urban village and rural households, is much smaller compared to the use of electricity.

Source of energy for heating space

Just fewer than a third (30.7%) of households use electricity for heating, made up mainly of national grid electricity (29.9%) and off-grid electricity (0.8%). Close to half of urban households (47.6%) and just under two-fifths of urban village households (36.2%) use electricity as a source of energy for heating space, compared to just over a tenth (13.1%) of rural households.

Gas, paraffin, coal, and wood are the main sources of energy for heating space, with over two-thirds (69.3%) of households using this combination of sources of energy, accounting for a higher proportion of rural households (86.9%) compared to urban households (52.4%) and urban village households (63.8%). This preference for gas, coal, and wood was also observed in the elderly, PWDs, as well as female-headed households at approximately 7 in 10 households.

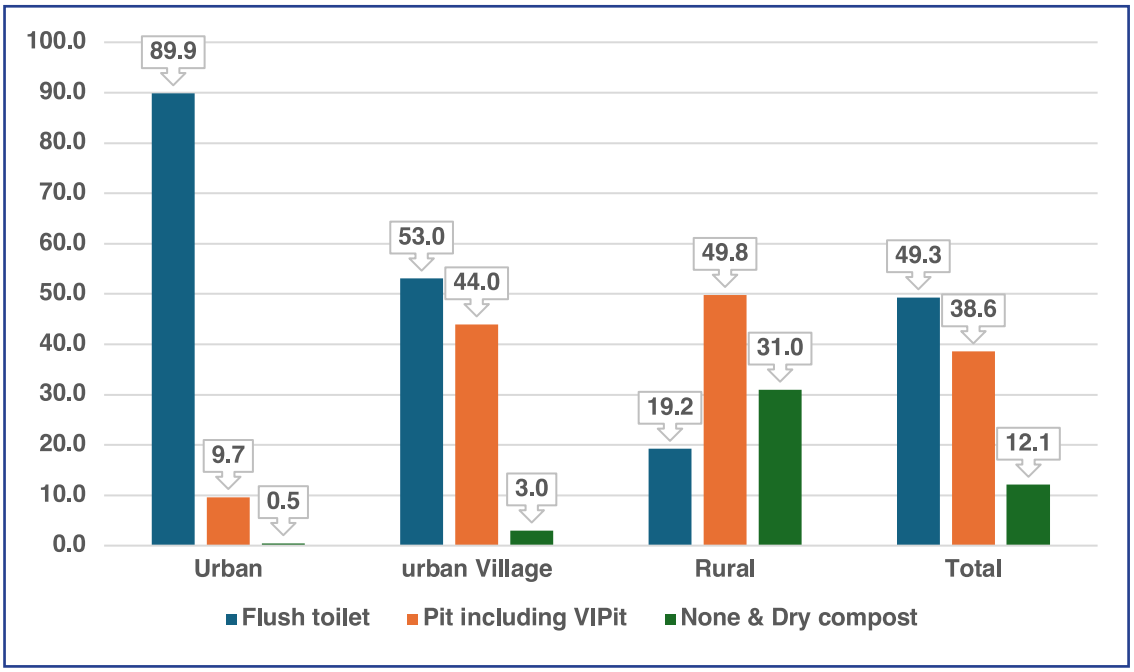
Source of energy for heating water

Overall, households' sources of energy for heating water were closely split between electricity (53.9%) and gas, paraffin, coal, and wood (46.1%), however, there are discernible differentials in the use of gas, paraffin, coal, wood for heating water. For example, close to nine out of every ten (84.2%) urban households use electricity for heating water, compared to fewer than two-thirds of urban-rural households (65.1%), compared to a fifth (20.8%) of rural households.

Access to toilet & sanitation facilities

Household access to toilet facilities, kitchen facilities, and sanitation was also used to understand the quality of housing and access. Close to half (49.3%) of households in Botswana have a flush toilet; 38.6% have a pit latrine, this includes the Ventilation Improved Toilet (VIP). Over a tenth of households either did not have access to a toilet or were using a system of "dried compost". As could be expected, the proportion of households with access to flush toilets is highest among households in urban areas (89.9%) and is discernibly lower among households in urban villages (53.0%) and rural areas (19.2%).

FIGURE 4: Percentage of households with access to sanitation



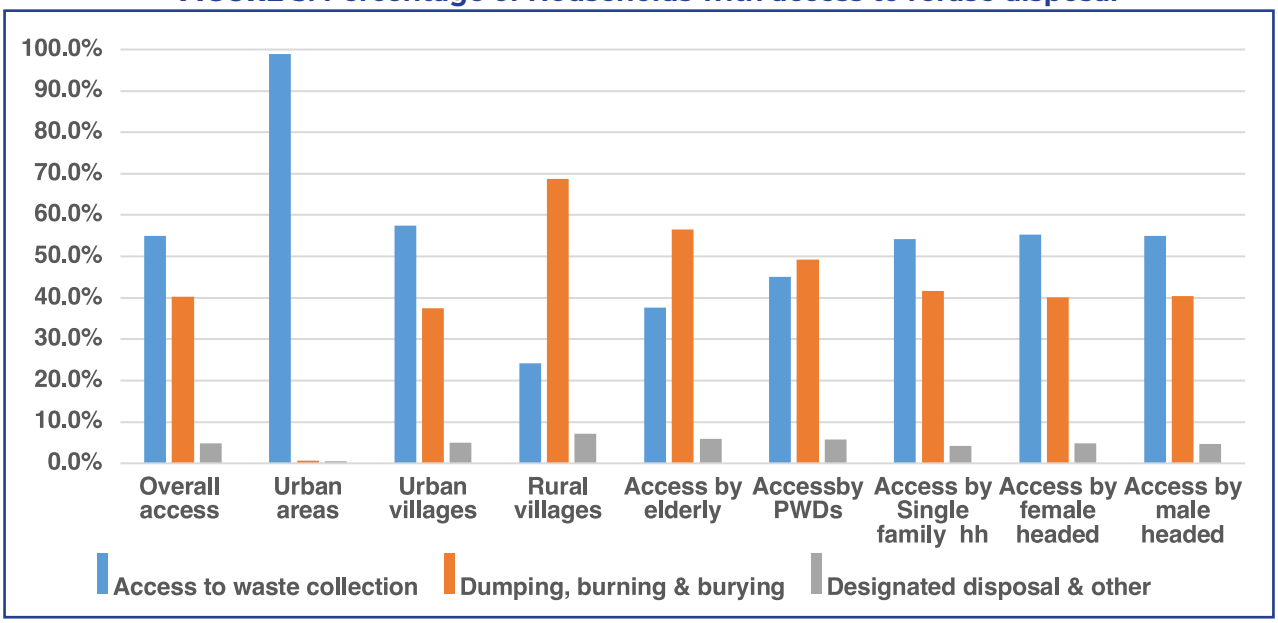
Conversely, households' use of pit latrines was much lower among households in urban areas (9.7%) and much higher among households in urban villages (`44.0%) and households in rural areas (49.8%). Having no access to toilet facilities was largely a phenomenon among rural households, with close to a third (31.0%) of households in rural areas having no access to toilet facilities, compared to 3 percent of households in urban villages and less one percent (0.5%) of households in urban areas. This is not only bad for the environment, but also affects quality of life.

Furthermore, a large proportion of the elderly (53.8%) use pit latrines compared to 45.5% of the PWDs. Approximately 4 in 10 males and females use pit latrines. Generally, the high incidence of pit latrines compromises environmental sustainability due to groundwater pollution and the breeding of diseases and rodents (Gwebu, 2003).

The results also show that over two-thirds of households had exclusive use of household toilet facilities, while over a quarter of households (27.8%) were sharing their toilet facilities with other households, while slightly over one in every twenty-five households (3.7%) were using communal toilet facilities or sharing with other households While the use of communal toilets is better than open defecation, sharing compromises the health and hygiene of households.

Refuse disposal

FIGURE 5: Percentage of Households with access to refuse disposal



Access to basic services such as waste disposal facilities is a key component of inclusivity and sustainability of housing as it determines the cleanliness of the living area and quality of life. Generally, 54.9% of households in Botswana have access to waste collection. The remainder either dumps, burns or buries their waste, which contaminates land and the air, increasing the risk of disease Collection is much lower in rural areas (24.1%), while 98.9% of urban households have regular collection. Lower access to collection is also observed among the elderly and people with disabilities, whose access is 37.6% and 45.1% respectively.

Discussion

Housing Quality:

The analysis underscores a significant disparity between rural and urban areas in housing quality within Botswana. While most households reside in housing units constructed with good quality materials for walls, floors, and roofs, rural areas exhibit a higher proportion of bad-quality housing units. This discrepancy reflects broader rural-urban disparities in infrastructure development and access to resources. Studies by Smith (2018) and Molefhe (2019) corroborate these findings, highlighting the need for targeted interventions to address housing inadequacies in rural regions. Such interventions could include government-led housing programs, community-driven initiatives, and partnerships with NGOs to improve housing infrastructure and promote sustainable development.

Household Water Sources:

The findings reveal disparities in access to water sources, particularly between rural and urban areas. While most households have access to piped drinking water, rural communities face challenges in water provision, relying more on communal sources. Furthermore, the analysis underscores the environmental implications of water-sourcing methods, as communal water sources may be less reliable and more susceptible to contamination. Sustainable water management practices and investments in water infrastructure are crucial to ensure equitable access to safe and clean drinking water for all households (UNDP, 2020). Furthermore, the reliance on communal and shared water sources by the elderly and PWDs who have limited mobility compromises their quality of life.

Household Energy Sources and Environmental Sustainability

Household energy sources play a pivotal role in determining housing conditions and environmental sustainability. While most households use electricity for lighting, cooking, and heating, reliance on traditional fuels such as wood, coal, and paraffin remain prevalent, especially in rural areas. This reliance on non-renewable energy sources not only contributes to indoor air pollution but also exacerbates deforestation and environmental degradation. Transitioning to cleaner and more sustainable energy alternatives, such as solar power and biogas, is essential to mitigate environmental impacts and promote climate resilience (IEA, 2020).

Conclusion

The analysis of housing conditions, land access, water sources, and energy use in Botswana sheds light on critical challenges and opportunities for sustainable development and environmental conservation. Disparities in housing quality between rural and urban areas underscore the need for targeted interventions to improve infrastructure and promote equitable access to safe and affordable housing. Moreover, the implementation of the land policy is essential to enhance land tenure security and support rural livelihoods. Access to clean and safe drinking water remains a pressing issue, particularly in rural communities, highlighting the importance of investing in water infrastructure and sustainable water management practices. Similarly, the transition to cleaner and more sustainable energy sources is imperative to mitigate environmental degradation and promote climate resilience.

Addressing housing inadequacies, promoting equitable land access, and enhancing water and energy access are fundamental steps towards achieving sustainable development goals in Botswana. It is also interesting to note that female-headed households have better access to quality housing and basic services. Policy reforms, promotion of community-driven initiatives, and collaborative partnerships with stakeholders can contribute to building resilient and inclusive communities while safeguarding the environment for future generations.

Recommendations:

Policy Level:

Review the National Policy on Housing to ensure it improves access to quality housing and infrastructure, and addresses the needs of all vulnerable groups, particularly in rural areas. While the proportion of households with poor housing quality, approximately 1 in 10, may appear low, the spirit of 'leaving no one behind' demands that housing policies targeting vulnerable groups be strengthened.

Strengthen implementation of the Botswana Land Policy of 2018 to enhance land tenure security and facilitate equitable access to land for housing.

Strengthen implementation of the National Master Plan for Sanitation and Wastewater (2003) and the Botswana National Water Policy (2011) to improve access to safe and clean drinking water and sanitation for all households. In addition, the National Policy on Housing and Urban Development Standards should be reviewed to address the lack of sanitation and phase out pit latrines in urban areas.

Strengthen implementation of the Renewable Energy Strategy and the Off-Grid Solar Action Plan to improve access to vulnerable households that are outside the grid. Increasing access to solar energy will also contribute towards achieving the 15% target of renewable energy contribution to the electricity mix by the year 2030.

Programme Level:

The implementation of programmes that seek to improve access to vulnerable groups such as the Destitute Housing Programme, Remote Area Dwellers Programme, Home Improvement and Turnkey Development Scheme should be strengthened to improve housing quality and adequacy, particularly in rural areas.

Strengthen implementation of ongoing sanitation and waste management programmes to promote safe, and sanitary human settlements in line with Vision 2036 ideals.

Provide technical assistance and financial support for the use of clean energy technologies, such as solar power and biogas, to reduce reliance on traditional fuels.

Strengthen awareness campaigns on waste management, and energy efficiency to promote safe refuse disposal, sustainable energy consumption practices, and environmental stewardship.

Organizational Level:

Collaboration with local authorities, Non-Governmental Organisations (NGOs) and Community-Based Organisations (CBOs) in the implementation of housing programmes and provision of technical assistance on renewable energy sources such as the ongoing biogas programme.

There is a need for integrated planning and implementation by the ministries responsible for housing, planning, land management, and local government to address infrastructure provision and service delivery in all settlements in Botswana, with a particular focus on rural areas.

Partner with renewable energy companies to distribute clean energy technologies and promote energy access in underserved communities.

Engage in capacity-building initiatives to enhance local institutions' capacity in water resource management, sanitation, waste management, and sustainable energy planning.

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APPENDIX TABLES

TABLE 3: Household Characteristics

HOUSEHOLD CHARACTERISTICS	OUTCOME	PERCENT	COUNT
Materials of construction of house wall	Poor quality	12.9	89,290
	Good quality	87.1	604,052
	Total	**100**	**693,342**
Materials of construction of house floor	Poor quality	7.3	50,866
	Good quality	92.7	642,462
	Total	**100**	**693,328**
Materials of construction of house roof	Poor quality	6	41,280
	Good quality	94	652,036
	Total	**100**	**693,316**
Quality of housing unit	Very poor	3.2	22,063
	Poor	4.5	31,142
	Fair	7.6	53,003
	Good	84.7	587,134
	Total	**100**	**693,342**
Number of rooms	1 Room	33.5	232,384
	2 Rooms	27.1	188,181
	3 Rooms	21	145,933
	4 Room	10.2	70,600
	5+ Rooms	8.1	56,193
	Total	**100**	**693,291**
Number of household members	1 member	9.3	220,156
	2 members	11	260,550
	3 members	12.8	301,192
	4 members	14.6	343,385
	5+ members	52.3	1,234,326
	Total	**100**	**2,359,609**
Tenure - acquisition of housing unit	Self built or bought	38.1	263,999
	Renting	36.1	250,175
	Free or family home	24.7	171,428
	Donated	1.1	7,704
	Total	**100**	**693,306**
Main Source of drinking water _ infrastructure	Communal or neighbour's tap	21.6	150,455
	Pipped in house or yard	78.4	546,706
	Total	**100**	**697,161**
Main Source of drinking water _ Source	Other	15.3	106,420
	Water Utilities Corporation	84.7	590,739
	Total	**100**	**697,159**
Principal source of water supply _Other use	Communal or neighbour's tap	21.8	152,226
	Pipped in house or yard	78.2	544,932
	Total	**100**	**697,158**

TABLE 3 CONT'D: Household Characteristics

HOUSEHOLD CHARACTERISTICS	OUTCOME	PERCENT	COUNT
Availability of toilet in household	Flush toilet	49.3	343,957
	Pit including VIPit	38.6	268,946
	None & Dry compost	12.1	84,250
	Total	**100**	**697,153**
Availability of toilet in household	Exclusive use	68.5	425,456
	Shared with other households	27.8	173,003
	Communal, shared with neighbours / none	3.7	22,767
	Total	**100**	**621,226**
Availability of toilet in household	Exclusive use	68.5	425,456
	Shared with other households	27.8	173,003
	Communal, shared with neighbour / none	3.7	22,767
	Total	**100**	**621,226**
Availability of toilet in household	Exclusive use	68.5	425,456
	Shared with other households	27.8	173,003
	Communal, shared with neighbours / none	3.7	22,767
	Total	**100**	**621,226**
Availability of bathroom in household	No	48.6	338,855
	Yes	51.4	358,291
	Total	**100**	**697,146**
Availability of kitchen in household	No	32.2	224,396
	Yes	67.8	472,747
	Total	**100**	**697,143**
Availability of refuse disposal	Collected	54.9	382,856
	Dumping, burning & burying	40.3	281,117
	Designated disposal & other	4.8	33,163
	Total	**100**	**697,136**
Source of energy for lighting	Electric national grid	73.4	511,660
	Off grid elect, solar & others electr	9	62,765
	Gas, candle, paraffin, wood etc	17.6	122,708
	Total	**100**	**697,133**
Source of energy for cooking	Electric national grid	25.3	176,110
	Off grid elect, solar & others electr	0.9	6,149
	Gas, paraffin, coal, wood etc	73.9	514,867
	Total	**100**	**697,126**
Source of energy for heating space	Electric national grid	29.9	208,767
	Off grid elect, solar & others electr	0.8	5,372
	Gas, paraffin, coal, wood etc	69.3	482,975
	Total	**100**	**697,114**
Source of energy for heating space	Electric national grid	52.8	368,396
	Off grid elect, solar & others electr	1.1	7,957
	Gas, paraffin, coal, wood etc	46	320,759
	Total	**100**	**697,112**
Tenure - access to land for housing	No	64.6	450,307
	Yes	35.4	246,920
	Total	**100**	**697,227**

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TABLE 4: Selected Household and Housing Characteristics, by Location

VARIABLE	Outcome	LOCALITY_TYPE							
		URBAN		URBAN VILLAGE		RURAL		Total	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent
Materials of construction of house wall	0 Poor quality								
	1 Good quality	5,525	3.7	13,323	4.4	70,442	29.5	89,290	12.9
	Total	**143,886**	**96.3**	**292,118**	**95.6**	**168,048**	**70.5**	**604,052**	**87.1**
Materials of construction of house floor	0 Poor quality	149,411	100	305,441	100	238,490	100	693,342	100
	1 Good quality	799	0.5	3,730	1.2	46,337	19.4	50,866	7.3
	Total	**148,612**	**99.5**	**301,706**	**98.8**	**192,144**	**80.6**	**642,462**	**92.7**
Materials of construction of house roof	0 Poor quality	149,411	100	305,436	100	238,481	100	693,328	100
	1 Good quality	6,309	4.2	6,616	2.2	28,355	11.9	41,280	6
	Total	**143,101**	**95.8**	**298,816**	**97.8**	**210,119**	**88.1**	**652,036**	**94**
Quality of housing unit	0 Very poor	149,410	100	305,432	100	238,474	100	693,316	100
	1 Poor	69	0	1,276	0.4	20,718	8.7	22,063	3.2
	2 Fair	563	0.4	2495	0.8	28,084	11.8	31,142	4.5
	3 Good	11,301	7.6	14,865	4.9	26,837	11.3	53,003	7.6
	Total	**137,478**	**92**	**286,805**	**93.9**	**162,851**	**68.3**	**587,134**	**84.7**
Number of rooms	1 1 Room	149,411	100	305,441	100	238,490	100	693,342	100
	2 2 Rooms	55,618	37.2	96,882	31.7	79,884	33.5	232,384	33.5
	3 3 Rooms	28,396	19	82,061	26.9	77,724	32.6	188,181	27.1
	4 4 Room	36,448	24.4	65,062	21.3	44,423	18.6	145,933	21
	5 5+ Rooms	19,061	12.8	31,693	10.4	19,846	8.3	70,600	10.2
	Total	**9,879**	**6.6**	**29,722**	**9.7**	**16,592**	**7**	**56,193**	**8.1**
Number of household members	1 1 member	149,402	100	305,420	100	238,469	100	69,3291	100
	2 2 members	54,547	12	86,225	7.7	79,384	10.1	220,156	9.3
	3 3 members	64,313	14.2	117,813	10.5	78,424	9.9	260,550	11
	4 4 members	72,579	16	142,084	12.7	86,529	11	301,192	12.8
	5 5+ members	84,440	18.7	163,456	14.6	95,489	12.1	343,385	14.6
	Total	**176,822**	**39.1**	**607,649**	**54.4**	**449,855**	**57**	**1,234,326**	**52.3**
Tenure - acquisition of housing unit	1 Self built or bought	452,701	100	1,117,227	100	789,681	100	2,359,609	100
	2 Renting	21,420	14.3	102,323	33.5	140,256	58.8	263,999	38.1
	3 Free or family home	95,015	63.6	130,021	42.6	25,139	10.5	250,175	36.1
	4 Donated	32,299	21.6	71,823	23.5	67,306	28.2	171,428	24.7
	Total	**672**	**0.4**	**1,260**	**0.4**	**5,772**	**2.4**	**7,704**	**1.1**
Main Source of drinking water _ infrastructure	0 Communal or neighbour's tap	149,406	100	305,427	100	238,473	100	693,306	100
	1 Pipped in house or yard	4,348	2.9	31,996	10.4	114,111	47.6	150,455	21.6
	Total	**145,781**	**97.1**	**275,189**	**89.6**	**125,736**	**52.4**	**546,706**	**78.4**

TABLE 4 CONT'D: Selected Household and Housing Characteristics, by Location

VARIABLE	Outcome	LOCALITY_TYPE							
		URBAN		URBAN VILLAGE		RURAL		Total	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent
Main Source of drinking water _ Source	0 Other	150,129	100	307,185	100	239,847	100	697,161	100
	1 Water Utilities Corporation	6,515	4.3	17,830	5.8	82,075	34.2	106,420	15.3
	Total	**143,614**	**95.7**	**289,353**	**94.2**	**157,772**	**65.8**	**590,739**	**84.7**
Principal source of water supply _ Other use	0 Communal or neighbour's tap	150,129	100	307,183	100	239,847	100	697,159	100
	1 Pipped in house or yard	4,950	3.3	32,981	10.7	114,295	47.7	152,226	21.8
	Total	**145,179**	**96.7**	**274,202**	**89.3**	**125,551**	**52.3**	**544,932**	**78.2**
Principal source of water supply _ Other use	0 Other	150,129	100	307,183	100	239,846	100	697,158	100
	1 Water Utilities Corporation	5,001	3.3	187,94	6.1	84,626	35.3	108,421	15.6
	Total	**145,128**	**96.7**	**288,384**	**93.9**	**155,220**	**64.7**	**588,732**	**84.4**
Availability of toilet in household	1 Flush toilet	150,129	100	307,178	100	239,846	100	697,153	100
	2 Pit including VIPit	134,918	89.9	162,932	53	46,107	19.2	343,957	49.3
	3 None & Dry compost	14,494	9.7	135,018	44	119,434	49.8	268,946	38.6
	Total	**718**	**0.5**	**9,228**	**3**	**74,304**	**31**	**84,250**	**12.1**
Availability of toilet in household	1 Exclusive use	150,130	100	307,178	100	239,845	100	697,153	100
	2 Shared with other house-holds	88,400	59.1	204,993	68.6	132,063	76.4	425,456	68.5
	3 Communal, shared with neighbours or none	60,314	40.3	87,371	29.2	25,318	14.7	173,003	27.8
	Total	**778**	**0.5**	**6,554**	**2.2**	**15,435**	**8.9**	**22,767**	**3.7**
Availability of bath-room in household	0 No	149,492	100	298,918	100	172,816	100	621,226	100
	1 Yes	46,621	31.1	130,432	42.5	161,802	67.5	338,855	48.6
	Total	**103,506**	**68.9**	**176,742**	**57.5**	**78,043**	**32.5**	**358,291**	**51.4**
Availability of kitchen in house-hold	0 No	150,127	100	30,7174	100	239,845	100	697,146	100
	1 Yes	34,396	22.9	76,945	25	113,055	47.1	224,396	32.2
	Total	**115,731**	**77.1**	**230,227**	**75**	**126,789**	**52.9**	**472,747**	**67.8**
Availability of re-fuse disposal	1 Collected	150,127	100	307,172	100	239,844	100	69,7143	100
	2 Dumping, burning & burying	148,476	98.9	176,508	57.5	57,872	24.1	382,856	54.9
	3 Designated disposal & other	909	0.6	115,192	37.5	165,016	68.8	281,117	40.3
	Total	**741**	**0.5**	**15,466**	**5**	**16,956**	**7.1**	**3,3163**	**4.8**

TABLE 4 CONT'D: Selected Household and Housing Characteristics, by Location

VARIABLE	Outcome	LOCALITY_TYPE							
		URBAN		URBAN VILLAGE		RURAL		Total	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent
Source of energy for lighting	1 Electric national grid	150,126	100	307,166	100	239,844	100	697,136	100
	2 Off grid elect, solar & others electr	137,142	91.4	273,627	89.1	100,891	42.1	511,660	73.4
	3 Gas, candle, paraffin, wood etc	2,081	1.4	6,797	2.2	53,887	22.5	62,765	9
	Total	**10,902**	**7.3**	**26,742**	**8.7**	**85,064**	**35.5**	**122,708**	**17.6**
Source of energy for cooking	1 Electric national grid	150,125	100	307,166	100	239,842	100	697,133	100
	2 Off grid elect, solar & others electr	49,907	33.2	95,532	31.1	30,671	12.8	176,110	25.3
	3 Gas, paraffin, coal, wood etc	1270	0.8	3178	1	1701	0.7	6,149	0.9
	Total	**98,947**	**65.9**	**208,454**	**67.9**	**207,466**	**86.5**	**514,867**	**73.9**
Source of energy for heating space	1 Electric national grid	150,124	100	307,164	100	239,838	100	697,126	100
	2 Off grid elect, solar & others electr	701,58	46.7	108,520	35.3	30,089	12.5	208,767	29.9
	3 Gas, paraffin, coal, wood etc	1,293	0.9	2741	0.9	1,338	0.6	5,372	0.8
	Total	**78,670**	**52.4**	**195,896**	**63.8**	**208,409**	**86.9**	**482,975**	**69.3**
Source of energy for heating space	1 Electric national grid	150,121	100	307,157	100	239,836	100	697,114	100
	2 Off grid elect, solar & others electr	124,196	82.7	196,272	63.9	47,928	20	368,396	52.8
	3 Gas, paraffin, coal, wood etc	2,241	1.5	3,763	1.2	1,953	0.8	7,957	1.1
	Total	**23,683**	**15.8**	**107,121**	**34.9**	**189,955**	**79.2**	**320,759**	**46**
Botswana Population & Housing Census, 2022		**150,120**	**100**	**307,156**	**100**	**239,836**	**100**	**697,112**	**100**

TABLE 5: Access To Housing By Age Of Household Head (Elderly)

VARIABLE	OUTCOME	ELDERLY STATUS OVER 65 YEARS OR NOT					
		ELDERLY HH		YOUNG HH		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT	PERCENT	COUNT
Materials of construction of house wall	Poor quality	15.8	15,066	12.4	73,872	12.9	88,938
	Good quality	84.2	80,194	87.6	522,482	87.1	602,676
	Total	**100.0**	**95,260**	**100.0**	**596,354**	**100.0**	**691,614**
Materials of construction of house floor	Poor quality	10.4	9,946	6.8	40,678	7.3	50,624
	Good quality	89.6	85,313	93.2	555,664	92.7	640,977
	Total	**100.0**	**95,259**	**100.0**	**596,342**	**100.0**	**691,601**
Materials of construction of house roof	Poor quality	7.9	7,547	5.6	33,682	6	41,229
	Good quality	92.1	87,712	94.4	562,646	94	650,358
	Total	**100.0**	**95,259**	**100.0**	**596,328**	**100.0**	**691,587**
Quality of housing unit	Very poor	5.6	5,304	2.8	16,670	3.2	21,974
	Poor	5.3	5,063	4.3	25,928	4.5	30,991
	Fair	6.8	6,523	7.8	46,404	7.7	52,927
	Good	82.3	78,370	85.1	507,352	84.7	585,722
	Total	**100.0**	**95,260**	**100.0**	**596,354**	**100.0**	**691,614**
Number of rooms	1 Room	14.4	13,709	36.5	217,441	33.4	231,150
	2 Rooms	23.6	22,496	27.7	165,247	27.1	187,743
	3 Rooms	26.4	25,178	20.2	120,572	21.1	145,750
	4 Room	17.1	16,243	9.1	54,446	10.2	70,689
	5+ Rooms	18.5	17,631	6.5	38,599	8.1	56,230
	Total	**100.0**	**95,257**	**100.0**	**596,305**	**100.0**	**691,562**
Tenure - acquisition of housing unit	Self built or bought	73.8	70,283	32.4	193,226	38.1	263,509
	Renting	2.5	2,418	41.4	247,044	36.1	249,462
	Free or family home	21.6	20,550	25.2	150,379	24.7	170,929
	Donated	2.1	2,008	1	5,668	1.1	7,676
	Total	**100.0**	**95,259**	**100.0**	**596,317**	**100.0**	**691,576**
Main Source of drinking water _ infrastructure	Communal or neighbour's tap	27.1	25,889	20.6	123,709	21.5	149,598
	Pipped in house or yard	72.9	69,793	79.4	476,011	78.5	545,804
	Total	**100.0**	**95,682**	**100.0**	**599,720**	**100.0**	**695,402**
Main Source of drinking water _ Source	Other	18.1	17,343	14.8	88,539	15.2	105,882
	Water Utilities Corporation	81.9	78,339	85.2	511,179	84.8	589,518
	Total	**100.0**	**95,682**	**100.0**	**599,718**	**100.0**	**695,400**
Principal source of water supply _Other use	Communal or neighbour's tap	27.5	26,290	20.9	125,077	21.8	151,367
	Pipped in house or yard	72.5	69,392	79.1	474,638	78.2	544,030
	Total	**100.0**	**95,682**	**100.0**	**599,715**	**100.0**	**695,397**
Availability of toilet in household	Flush toilet	31.5	30,113	52.3	313,523	49.4	343,636
	Pit including VIPit	53.8	51,462	36.1	216,623	38.6	268,085
	None & Dry compost	14.7	14,106	11.6	69,561	12	83,667
	Total	**100.0**	**95,681**	**100.0**	**599,707**	**100.0**	**695,388**
Availability of toilet in household	Exclusive use	85.1	70,832	66	354,014	68.5	424,846
	Shared with other households	10.7	8,874	30.5	163,558	27.8	172,432
	Communal, shared with neighbours or none	4.2	3,507	3.6	19,216	3.7	22,723
	Total	**100.0**	**83,213**	**100.0**	**536,788**	**100.0**	**620,001**

TABLE 5 CONT'D: Access To Housing By Age Of Household Head (Elderly)

VARIABLE	OUTCOME	ELDERLY STATUS OVER 65 YEARS OR NOT					
		ELDERLY HH		YOUNG HH		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT	PERCENT	COUNT
Availability of toilet in household	Exclusive use	85.1	70,832	66	354,014	68.5	424,846
	Shared with other households	10.7	8,874	30.5	163,558	27.8	172,432
	Communal, shared with neighbours or none	4.2	3,507	3.6	19,216	3.7	22,723
	Total	**100.0**	**83,213**	**100.0**	**536,788**	**100.0**	**620,001**
Availability of toilet in household	Exclusive use	85.1	70,832	66	354,014	68.5	424,846
	Shared with other households	10.7	8,874	30.5	163,558	27.8	172,432
	Communal, shared with neighbours or none	4.2	3,507	3.6	19,216	3.7	22,723
	Total	**100.0**	**83,213**	**100.0**	**536,788**	**100.0**	**620,001**
Availability of bathroom in household	No	54	51,656	47.7	285,882	48.5	337,538
	Yes	46	44,025	52.3	313,818	51.5	357,843
	Total	**100.0**	**95,681**	**100.0**	**599,700**	**100.0**	**695,381**
Availability of kitchen in household	No	32.3	30,950	32.1	192,468	32.1	223,418
	Yes	67.7	64,731	67.9	407,227	67.9	471,958
	Total	**100.0**	**95,681**	**100.0**	**599,695**	**100.0**	**695,376**
Availability of refuse disposal	Collected	37.6	35,939	57.8	346,472	55	382,411
	Dumping, burning & burying	56.5	54,058	37.7	225,865	40.3	279,923
	Designated disposal & other	5.9	5,684	4.6	27,351	4.8	33,035
	Total	**100.0**	**95,681**	**100.0**	**599,688**	**100.0**	**695,369**
Source of energy for lighting	Electric national grid	65.1	62,274	74.8	448,570	73.5	510,844
	Off grid elect, solar & others electr	10.1	9,635	8.8	52,797	9	62,432
	Gas, candle, paraffin, wood etc	24.8	23,772	16.4	98,316	17.6	122,088
	Total	**100.0**	**95,681**	**100.0**	**599,683**	**100.0**	**695,364**
Source of energy for cooking	Electric national grid	17.1	16,375	26.6	159,523	25.3	175,898
	Off grid elect, solar & others electr	0.7	678	0.9	5,498	0.9	6,176
	Gas, paraffin, coal, wood etc	82.2	78,628	72.5	434,653	73.8	513,281
	Total	**100.0**	**95,681**	**100.0**	**599,674**	**100.0**	**695,355**
Source of energy for heating space	Electric national grid	20.1	19,206	31.6	189,368	30	208,574
	Off grid elect, solar & others electr	0.6	575	0.8	4,831	0.8	5,406
	Gas, paraffin, coal, wood etc	79.3	75,900	67.6	405,463	69.2	481,363
	Total	**100.0**	**95,681**	**100.0**	**599,662**	**100.0**	**695,343**
Source of energy for heating water	Electric national grid	28.6	27,361	56.8	340,331	52.9	367,692
	Off grid elect, solar & others electr	0.6	605	1.2	7,378	1.1	7,983
	Gas, paraffin, coal, wood etc	70.8	67,714	42	251,952	46	319,666
	Total	**100.0**	**95,680**	**100.0**	**599,661**	**100.0**	**695,341**
Tenure - access to land for housing	No	37.4	35,818	68.9	413,273	64.6	449,091
	Yes	62.6	59,867	31.1	186,518	35.4	246,385
	Total	**100.0**	**95,685**	**100.0**	**599,791**	**100.0**	**695,476**

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TABLE 6: Access to Housing by Disability status of Household Head

VARIABLE	OUTCOME	DISABLED		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT
Materials of construction of house wall	Poor quality	16.3	26,080	12.9	88,785
	Good quality	83.7	134,021	87.1	602,148
	Total	**100.0**	**160,101**	**100.0**	**690,933**
Materials of construction of house floor	Poor quality	10.2	16,369	7.3	50,528
	Good quality	89.8	143,730	92.7	640,392
	Total	**100.0**	**160,099**	**100.0**	**690,920**
Materials of construction of house roof	Poor quality	7.5	11,990	5.9	41,085
	Good quality	92.5	148,108	94.1	649,823
	Total	**100.0**	**160,098**	**100.0**	**690,908**
Quality of housing unit	Very poor	4.8	7,680	3.2	21,910
	Poor	5.9	9,464	4.5	30,958
	Fair	7.8	12,476	7.6	52,790
	Good	81.5	130,481	84.7	585,275
	Total	**100.0**	**160,101**	**100.0**	**690,933**
Number of rooms	1 Room	26.3	42,183	33.4	231,072
	2 Rooms	27.9	44,662	27.1	187,529
	3 Rooms	22.9	36,687	21.1	145,590
	4 Room	12.1	19,303	10.2	70,564
	5+ Rooms	10.8	17,259	8.1	56,128
	Total	**100.0**	**160,094**	**100.0**	**690,883**
Tenure - acquisition of housing unit	Self built or bought	54	86,436	38.1	263,112
	Renting	19.9	31,926	36.1	249,331
	Free or family home	24.1	38,506	24.7	170,782
	Donated	2	3,228	1.1	7,672
	Total	**100.0**	**160,096**	**100.0**	**690,897**
Main Source of drinking water _ infrastructure	Communal or neighbour's tap	26.9	43,319	21.5	149,491
	Pipped in house or yard	73.1	117,650	78.5	545,234
	Total	**100.0**	**160,969**	**100.0**	**694,725**
Main Source of drinking water _ Source	Other	17.7	28,525	15.2	105,748
	Water Utilities Corporation	82.3	132,444	84.8	588,975
	Total	**100.0**	**160,969**	**100.0**	**694,723**
Principal source of water supply _Other use	Communal or neighbour's tap	27.3	43,909	21.8	151,262
	Pipped in house or yard	72.7	117,060	78.2	543,459
	Total	**100.0**	**160,969**	**100.0**	**694,721**
Availability of toilet in household	Flush toilet	38.7	62,218	49.4	343,197
	Pit including VIPit	45.5	73,208	38.6	267,905
	None & Dry compost	15.9	25,542	12	83,613
	Total	**100.0**	**160,968**	**100.0**	**694,715**
Availability of toilet in household	Exclusive use	74.7	103,010	68.5	424,357
	Shared with other households	20.7	28,531	27.8	172,348
	Communal, shared with neighbours or none	4.6	6,376	3.7	22,659
	Total	**100.0**	**137,917**	**100.0**	**619,364**

TABLE 6 CONT'D: Access to Housing by Disability status of Household Head

VARIABLE	OUTCOME	DISABLED		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT
Availability of toilet in household	Exclusive use	74.7	103,010	68.5	424,357
	Shared with other households	20.7	28,531	27.8	172,348
	Communal, shared with neighbours or none	4.6	6,376	3.7	22,659
	Total	**100.0**	**137,917**	**100.0**	**619,364**
Availability of toilet in household	Exclusive use	74.7	103,010	68.5	424,357
	Shared with other households	20.7	28,531	27.8	172,348
	Communal, shared with neighbours or none	4.6	6,376	3.7	22,659
	Total	**100.0**	**137,917**	**100.0**	**619,364**
Availability of bathroom in household	No	53.3	85,837	48.6	337,343
	Yes	46.7	75,131	51.4	357,365
	Total	**100.0**	**160,968**	**100.0**	**694,708**
Availability of kitchen in household	No	34.2	55,097	32.1	223,294
	Yes	65.8	105,871	67.9	471,410
	Total	**100.0**	**160,968**	**100.0**	**694,704**
Availability of refuse disposal	Collected	45.1	72,596	55	381,962
	Dumping, burning & burying	49.2	79,166	40.3	279,718
	Designated disposal & other	5.7	9,205	4.8	33,017
	Total	**100.0**	**160,967**	**100.0**	**694,697**
Source of energy for lighting	Electric national grid	65.8	105,992	73.5	510,332
	Off grid elect, solar & others electr	10.5	16,978	9	62,385
	Gas, candle, paraffin, wood etc	23.6	37,996	17.6	121,976
	Total	**100.0**	**160,966**	**100.0**	**694,693**
Source of energy for cooking	Electric national grid	20.5	32,939	25.3	175,611
	Off grid elect, solar & others electr	0.7	1,142	0.9	6,137
	Gas, paraffin, coal, wood etc	78.8	126,884	73.8	512,938
	Total	**100.0**	**160,965**	**100.0**	**694,686**
Source of energy for heating space	Electric national grid	22.7	36,467	30	208,281
	Off grid elect, solar & others electr	0.6	1,003	0.8	5,366
	Gas, paraffin, coal, wood etc	76.7	123,493	69.2	481,027
	Total	**100.0**	**160,963**	**100.0**	**694,674**
Source of energy for heating water	Electric national grid	38.9	62,662	52.9	367,345
	Off grid elect, solar & others electr	1	1,545	1.1	7,950
	Gas, paraffin, coal, wood etc	60.1	96,755	46	319,377
	Total	**100.0**	**160,962**	**100.0**	**694,672**
Tenure - access to land for housing	No	52.9	85,125	64.6	448,765
	Yes	47.1	75,852	35.4	246,028
	Total	**100.0**	**160,977**	**100.0**	**694,793**

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TABLE 7: Access to Housing by Marital Status (Single HH)

VARIABLE	OUTCOME	SINGLE STATUS			
		SINGLE		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT
Materials of construction of house wall	Poor quality	13.8	52,175	12.9	88,862
	Good quality	86.2	327,075	87.1	602,329
	Total	**100.0**	**379,250**	**100.0**	**691,191**
Materials of construction of house floor	Poor quality	7.9	29,864	7.3	50,582
	Good quality	92.1	349,376	92.7	640,596
	Total	**100.0**	**379,240**	**100.0**	**691,178**
Materials of construction of house roof	Poor quality	6	22,589	6	41,131
	Good quality	94	356,644	94	650,035
	Total	**100.0**	**379,233**	**100.0**	**691,166**
Quality of housing unit	Very poor	3.3	12,489	3.2	21,947
	Poor	4.9	18,692	4.5	30,973
	Fair	7.9	29,804	7.6	52,826
	Good	83.9	318,265	84.7	585,445
	Total	**100.0**	**379,250**	**100.0**	**691,191**
Number of rooms	1 Room	41.5	157,291	33.4	231,110
	2 Rooms	26.7	101,427	27.1	187,603
	3 Rooms	17.7	66,969	21.1	145,664
	4 Room	7.9	29,932	10.2	70,607
	5+ Rooms	6.2	23,603	8.1	56,157
	Total	**100.0**	**379,222**	**100.0**	**691,141**
Tenure - acquisition of housing unit	Self built or bought	30.7	116,570	38.1	263,261
	Renting	39.9	151,154	36.1	249,378
	Free or family home	28	106,298	24.7	170,841
	Donated	1.4	5,205	1.1	7,675
	Total	**100.0**	**379,227**	**100.0**	**691,155**
Main Source of drinking water _ infrastructure	Communal or neighbour's tap	23	87,887	21.5	149,559
	Pipped in house or yard	77	293,643	78.5	545,423
	Total	**100.0**	**381,530**	**100.0**	**694,982**
Main Source of drinking water _ Source	Other	15.4	58,774	15.2	105,811
	Water Utilities Corporation	84.6	322,756	84.8	589,169
	Total	**100.0**	**381,530**	**100.0**	**694,980**
Principal source of water supply _Other use	Communal or neighbour's tap	23.2	88,597	21.8	151,324
	Pipped in house or yard	76.8	292,932	78.2	543,653
	Total	**100.0**	**381,529**	**100.0**	**694,977**
Availability of toilet in household	Flush toilet	45.9	174,950	49.4	343,346
	Pit including VIPit	41	156,333	38.6	267,973
	None & Dry compost	13.2	50,241	12	83,650
	Total	**100.0**	**381,524**	**100.0**	**694,969**
Availability of toilet in household	Exclusive use	61.6	207,147	68.5	424,524
	Shared with other households	34.2	115,039	27.8	172,384
	Communal, shared with neighbours or none	4.1	13,949	3.7	22,683
	Total	**100.0**	**336,135**	**100.0**	**619,591**

TABLE 7 CONT'D:Access to Housing by Marital Status (Single HH)

VARIABLE	OUTCOME	SINGLE STATUS			
		SINGLE		TOTAL	
		PERCENT	COUNT	PERCENT	COUNT
Availability of toilet in household	Exclusive use	61.6	207,147	68.5	424,524
	Shared with other households	34.2	115,039	27.8	172,384
	Communal, shared with neighbours or none	4.1	13,949	3.7	22,683
	Total	**100.0**	**336,135**	**100.0**	**619,591**
Availability of toilet in household	Exclusive use	61.6	207,147	68.5	424,524
	Shared with other households	34.2	115,039	27.8	172,384
	Communal, shared with neighbours or none	4.1	13,949	3.7	22,683
	Total	**100.0**	**336,135**	**100.0**	**619,591**
Availability of bathroom in household	No	55.2	210,785	48.6	337,446
	Yes	44.8	170,733	51.4	357,516
	Total	**100.0**	**381,518**	**100.0**	**694,962**
Availability of kitchen in household	No	37.6	143,480	32.1	223,360
	Yes	62.4	238,035	67.9	471,597
	Total	**100.0**	**381,515**	**100.0**	**694,957**
Availability of refuse disposal	Collected	54.2	206,934	55	382,104
	Dumping, burning & burying	41.6	158,526	40.3	279,819
	Designated disposal & other	4.2	16,051	4.8	33,027
	Total	**100.0**	**381,511**	**100.0**	**694,950**
Source of energy for lighting	Electric national grid	70.5	269,135	73.5	510,495
	Off grid elect, solar & others electr	9.2	35,220	9	62,412
	Gas, candle, paraffin, wood etc	20.2	77,153	17.6	122,038
	Total	**100.0**	**381,508**	**100.0**	**694,945**
Source of energy for cooking	Electric national grid	24.1	91,777	25.3	175,713
	Off grid elect, solar & others electr	0.9	3,510	0.9	6,148
	Gas, paraffin, coal, wood etc	75	286,216	73.8	513,076
	Total	**100.0**	**381,503**	**100.0**	**694,937**
Source of energy for heating space	Electric national grid	27.8	106,037	30	208,386
	Off grid elect, solar & others electr	0.8	2,965	0.8	5,374
	Gas, paraffin, coal, wood etc	71.4	272,493	69.2	481,165
	Total	**100.0**	**381,495**	**100.0**	**694,925**
Source of energy for heating water	Electric national grid	52.2	199,018	52.9	367,457
	Off grid elect, solar & others electr	1.1	4,013	1.1	7,954
	Gas, paraffin, coal, wood etc	46.8	178,463	46	319,512
	Total	**100.0**	**381,494**	**100.0**	**694,923**
Tenure - access to land for housing	No	72.3	275,718	64.6	448,895
	Yes	27.7	105,855	35.4	246,157
	Total	**100.0**	**381,573**	**100.0**	**695,052**

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TABLE 8: Access to Housing by Sex of Head of HH (Female Headed Household)

Variable	Outcome	Male HH		Female HH		Total	
		Percent	Count			Percent	Count
Materials of construction of house wall		14.9	56,509	10.4	32,458	12.9	88,967
	Poor quality	85.1	323,621	89.6	279,226	87.1	602,847
	Good quality	100.0	380,130	100.0	311,684	100.0	691,814
	Total	**8.7**	**32,966**	**5.7**	**17,677**	**7.3**	**50,643**
Materials of construction of house floor	Poor quality	91.3	347,154	94.3	294,002	92.7	641,156
	Good quality	100.0	380,120	100.0	311,679	100.0	691,799
	Total	**6.1**	**23,298**	**5.8**	**17,961**	**6**	**41,259**
Materials of construction of house roof	Poor quality	93.9	356,814	94.2	293,712	94	650,526
	Good quality	100.0	380,112	100.0	311,673	100.0	691,785
	Total	**3.3**	**12,447**	**3.1**	**9,540**	**3.2**	**21,987**
Quality of housing unit	Very poor	5.7	21,585	3	9,417	4.5	31,002
	Poor	8.5	32,290	6.6	20,658	7.7	52,948
	Fair	82.6	313,808	87.3	272,069	84.7	585,877
	Good	100.0	380,130	100.0	311,684	100.0	691,814
	Total	**37.7**	**143,393**	**28.2**	**87,787**	**33.4**	**231,180**
Number of rooms	1 Room	26.3	99,952	28.2	87,839	27.1	187,791
	2 Rooms	19.9	75,574	22.5	70,244	21.1	145,818
	3 Rooms	9.2	35,122	11.4	35,590	10.2	70,712
	4 Room	6.9	26,059	9.7	30,199	8.1	56,258
	5+ Rooms	100.0	380,100	100.0	311,659	100.0	691,759
	Total	**34.4**	**130,935**	**42.6**	**132,650**	**38.1**	**263,585**
Tenure - acquisition of housing unit	Self built or bought	39.1	148,711	32.3	100,812	36.1	249,523
	Renting	25.5	97,013	23.7	73,973	24.7	170,986
	Free or family home	0.9	3,449	1.4	4,230	1.1	7,679
	Donated	100.0	380,108	100.0	311,665	100.0	691,773
	Total	**23.7**	**90,468**	**18.9**	**59,147**	**21.5**	**149,615**
Main Source of drinking water _ infrastructure	Communal or neighbour's tap	76.3	291,930	81.1	254,054	78.5	545,984
	Pipped in house or yard	100.0	382,398	100.0	313,201	100.0	695,599
	Total	**19.3**	**73,635**	**10.3**	**32,266**	**15.2**	**105,901**
Main Source of drinking water _ Source	Other	80.7	308,761	89.7	280,935	84.8	589,696
	Water Utilities Corporation	100.0	382,396	100.0	313,201	100.0	695,597
	Total	**23.9**	**91,349**	**19.2**	**60,036**	**21.8**	**151,385**
Principal source of water supply _Other use	Communal or neighbour's tap	76.1	291,044	80.8	253,165	78.2	544,209
	Pipped in house or yard	100.0	382,393	100.0	313,201	100.0	695,594
	Total	**49.9**	**190,896**	**48.8**	**152,901**	**49.4**	**343,797**
Availability of toilet in household	Flush toilet	36.2	138,522	41.4	129,592	38.5	268,114
	Pit including VIPit	13.9	52,970	9.8	30,704	12	83,674
	None & Dry compost	100.0	382,388	100.0	313,197	100.0	695,585
	Total	**66.7**	**223,208**	**70.7**	**201,776**	**68.5**	**424,984**

TABLE 8 CONT'D: Access to Housing by Sex of Head of HH (Female Headed Household)

Variable	Outcome	Male HH		Female HH		Total	
		Percent		Count		Percent	Count
Availability of toilet in household	Exclusive use	29.5	98,692	25.8	73,771	27.8	172,463
	Shared with other households	3.8	12,818	3.5	9,931	3.7	22,749
	Communal, shared with neighbours or none	100.0	334,718	100.0	285,478	100.0	620,196
	Total	**66.7**	**223,208**	**70.7**	**201,776**	**68.5**	**424,984**
Availability of toilet in household	Exclusive use	29.5	98,692	25.8	73,771	27.8	172,463
	Shared with other households	3.8	12,818	3.5	9,931	3.7	22,749
	Communal, shared with neighbours or none	100.0	334,718	100.0	285,478	100.0	620,196
	Total	**49.6**	**189,501**	**47.3**	**148,070**	**48.5**	**337,571**
Availability of bathroom in household	No	50.4	192,883	52.7	165,124	51.5	358,007
	Yes	100.0	382,384	100.0	313,194	100.0	695,578
	Total	**34**	**130,028**	**29.8**	**93,414**	**32.1**	**223,442**
Availability of kitchen in household	No	66	252,352	70.2	219,779	67.9	472,131
	Yes	100.0	382,380	100.0	313,193	100.0	695,573
	Total	**54.9**	**209,797**	**55.2**	**172,772**	**55**	**382,569**
Availability of refuse disposal	Collected	40.4	154,511	40.1	125,448	40.2	279,959
	Dumping, burning & burying	4.7	18,068	4.8	14,970	4.7	33,038
	Designated disposal & other	100.0	382,376	100.0	313,190	100.0	695,566
	Total	**70.9**	**271,035**	**76.6**	**239,975**	**73.5**	**511,010**
Source of energy for lighting	Electric national grid	11.4	43,469	6.1	18,970	9	62,439
	Off grid elect, solar & others electr	17.7	67,867	17.3	54,245	17.6	122,112
	Gas, candle, paraffin, wood etc	100.0	382,371	100.0	313,190	100.0	695,561
	Total	**25.6**	**97,795**	**25**	**78,183**	**25.3**	**175,978**
Source of energy for cooking	Electric national grid	0.9	3,598	0.8	2,586	0.9	6,184
	Off grid elect, solar & others electr	73.5	280,974	74.2	232,416	73.8	513,390
	Gas, paraffin, coal, wood etc	100.0	382,367	100.0	313,185	100.0	695,552
	Total	**30.3**	**115,713**	**29.7**	**92,966**	**30**	**208,679**
Source of energy for heating space	Electric national grid	0.8	3,146	0.7	2,268	0.8	5,414
	Off grid elect, solar & others electr	68.9	263,497	69.6	217,946	69.2	481,443
	Gas, paraffin, coal, wood etc	100.0	382,356	100.0	313,180	100.0	695,536
	Total	**53.7**	**205,300**	**51.9**	**162,522**	**52.9**	**367,822**
Source of energy for heating water	Electric national grid	1.2	4,538	1.1	3,450	1.1	7,988
	Off grid elect, solar & others electr	45.1	172,516	47	147,208	46	319,724
	Gas, paraffin, coal, wood etc	100.0	382,354	100.0	313,180	100.0	695,534
	Total	**64.2**	**245,708**	**65**	**203,495**	**64.6**	**449,203**
Tenure - access to land for housing	No	35.8	136,733	35	109,743	35.4	246,476
	Yes	100.0	382,441	100.0	313,238	100.0	695,679
	Total	**100.0**	**382,441**	**100.0**	**313,238**	**100.0**	

Botswana Population & Housing Census, 2022

Mpala, Ke Batlhokwa

Private Bag 0024, Gaborone
Tel: 3671300 **Fax:** 3952201
Toll Free: 0800 600 200

Private Bag F193,
Francistown
Tel. 241 5848, **Fax.** 241 7540

Private Bag 47
Maun
Tel: 371 5716 **Fax:** 686 4327

E-mail: info@statsbots.org.bw **Website:** http://www.statsbots.org.bw

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