



Botswana

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Botswana Country Report



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General Country Profile

Geography and Population

Botswana is a landlocked nation located in Southern Africa with a population of about 2.4 million people. Neighboring countries include Namibia, Zambia, Zimbabwe, and South Africa. The Chobe and Molopo rivers lie at the northern and southern borders, respectively. The Limpopo River follows much of Botswana's southeastern border with South Africa. From the Angolan highlands, the Okavango River drains southward to Botswana before emptying into the Makgadikgadi Pans, one of the world's largest salts flats (Parsons et al., 2022). Botswana's total area is 581,730 square kilometers, about the same size as France (Countries and Their Cultures, 2006). The largest city and capital is Gaborone, with a population of 232,000 (World Population Review, 2022).

Figure 1.

National Flag of Botswana



From (Flag Lane, 2022)

The country's environment consists of eastern rocky hill ranges and arid regions of the Kalahari Desert, which cover two-thirds of the country. Several lake beds occupy the lower part of the Kalahari basin. Winter lasts from April to September. October to March are the summer months when temperatures may rise to about 34° C (94° F). The rainfall season happens between December and March, allowing for farming. Every two decades, cyclic droughts spanning up to 6 years can hinder crop harvests and livestock maintenance (Parsons, 2022).

Botswana has several national parks, including the Central Kalahari Game reserve, Chobe National Park, and the Kgalagadi Transfrontier Park. The Kalahari Desert occupies much of the country. It can more accurately be described as a dry steppe due to the greater prevalence of savanna grassland than true sand. Savanna grassland refers to vegetation consisting of yellowish-brown dry grass interspersed with trees and woodland regions. Entire forests can be

seen in the northern and eastern sections of the Kalahari. Across Botswana, the climate is consistently dry and warm throughout the year with humid periods in the summers. During the winter months, days can be warm, but temperatures can decrease to near freezing at night. Regarding ecological diversity, the wildlife is reflective of Botswana’s landscape and climate. Over 30 species of bats and large mammals, 200 species of reptiles and amphibians, and 460 species of birds are found in the country. Fish such as African bream and tigerfish are also seen in rivers (Parsons, 2022).

Figure 2

Map of Botswana



From (Parsons, 2022)

Table 1

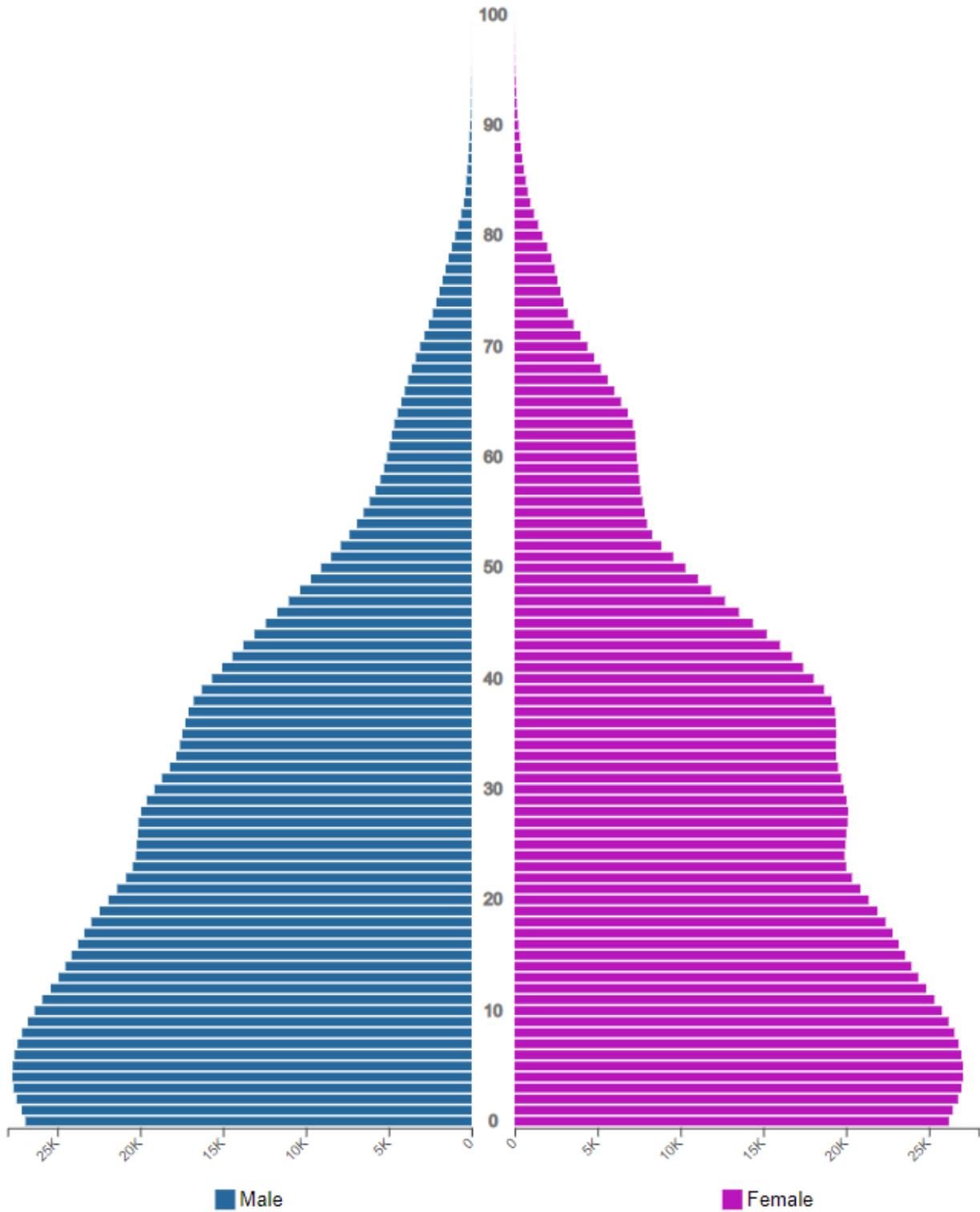
Population Statistics and United Nations Human Development (HDI) Score

Statistic	Numerical Value	World Rank
Total Population	2,420,543	145
Annual Population Growth Rate %	2.11	50
% Population in Rural Areas	29.123	-
United Nations HDI Score	0.735	100

From (Human Development Reports, 2020; World Bank, 2022; World Population Review , 2022)

Figure 3

Stratified Population Age Distribution of Botswana



From (World Population Review , 2022)

History and Culture

The history of Botswana dates back thousands of years to Khoisan hunter-gatherers (“Bushmen”) living in the Tsodilo Hills of the Okavango delta. Bantu-speaking people gradually migrated to Botswana around 20 BCE, introducing grain crops and developing iron tools. During this Iron Age, various chiefdoms were seen until the rise of the Tswana dynasties in the 17th century. Prosperous trading in ivory and other goods occurred during the 1800s when Christian missionaries and white gold miners entered the region. In 1885, British settlers declared the area the “Bechuanaland Protectorate” (Countries and Their Cultures, 2006; Parsons, 2022).

During the 20th century, Botswana’s politics were directly affected by those of its more populous neighbor, South Africa. This was by virtue of their close proximity to each other and shared subordination to the British empire. In 1950, Botswana’s servitude to British interests in South Africa was made most apparent. The British barred Seretse Khama from the Ngwato chieftainship (leadership of a Tswana-derived tribe) and exiled him for six years because of his marriage to a white Englishwoman. This was done at a time when apartheid policies were actively enforced in South Africa, and Khama’s marriage could undermine British support for racial segregation. In the late 1950s, nationalist spirit grew in the protectorate. The British were receptive and peacefully accepted political change. The Bechuanaland Democratic Party (BDP) was founded in 1960, and Gaborone was established as the capital in 1965. In 1966, the country proclaimed independence and became known as the Republic of Botswana, with Seretse Khama serving as the first president (Parsons, 2022).

The country positioned itself as a liberal democracy emphasizing nonethnic citizenship, in stark contrast to South Africa at the time. The emergence of diamond mines allowed rapid economic expansion in the 1970s and 80s (Countries and Their Cultures, 2006; Parsons, 2022). Economic regression occurred in the 90s, and the AIDS epidemic intensified, resulting in one of the highest infection rates in the world. The government responded promptly, even becoming the first African nation to administer free HIV antiretroviral drugs to its citizens. Although various political groups have appeared, the BDP has maintained a government majority, with Mokgweetsi Masisi serving as current president since 2018 (Parsons, 2022). Additionally, Botswana is a peaceful nation with some of the lowest levels of corruption in the region. The country has not directly experienced armed conflict or civil unrest. In 2021, Botswana sent military troops to nearby Mozambique to help the country fight insurgents (Meldrum A., Bowker T., 2021).

The dominant ethnic identity in Botswana is Tswana (79%), followed by Kalanga (11%), Basarwa (3%), and others such as the Kgalagadi people and European descendants (7%). Christianity is the majority religion (79.1%), followed by non-religious (15.2%) and Badimo (4.1%). Although English is the official language, only 2.8% of the population speaks it. Most people speak the national language, Setswana (77.3%), as well as Sekalanga (7.4%) (CIA, 2021). English is utilized at the government level and in higher education, like the University of Botswana (Countries and Their Cultures, 2006). Social rites concerning birth, marriage, and death conform to the values of the majority Christian population (Parsons, 2022). Some churches may incorporate local practices from older religions to accommodate their congregation. The prominence of Christianity and English makes Botswana hospitable to Western travelers.

Etiquette in Botswana emphasizes the traditional customs of African culture. The youth should be respectful of elders, and women should be respectful of men. Young people should address senior men as *Rra* and women as *Mma*, which respectively mean father and mother. Western dress is acceptable and is normal among people in Botswana. Generally, women are expected to keep their thighs covered, but this custom is changing among younger people and in urban centers. The Setswana language and traditional Tswana customs prevail in the household. In urban areas and for matters of government or school, English language and principles predominate. Overall, Tswana and English cultures intermix and rotate depending on context (Parsons, 2022).

Government and Legal System

Under the 1966 constitution, Botswana is a parliamentary republic. The executive branch consists of an elected president (Mokgweetswe Masisi) who serves as the head of state and government, as well as a corresponding vice president (Slumber Tsogwane). The president is indirectly elected by the national assembly for 5-year terms, with a 10-year term limit. The president chooses the vice president and advisory cabinet (CIA, 2021; Parsons, 2022). At the time of this writing, the next election is scheduled for October 2024.

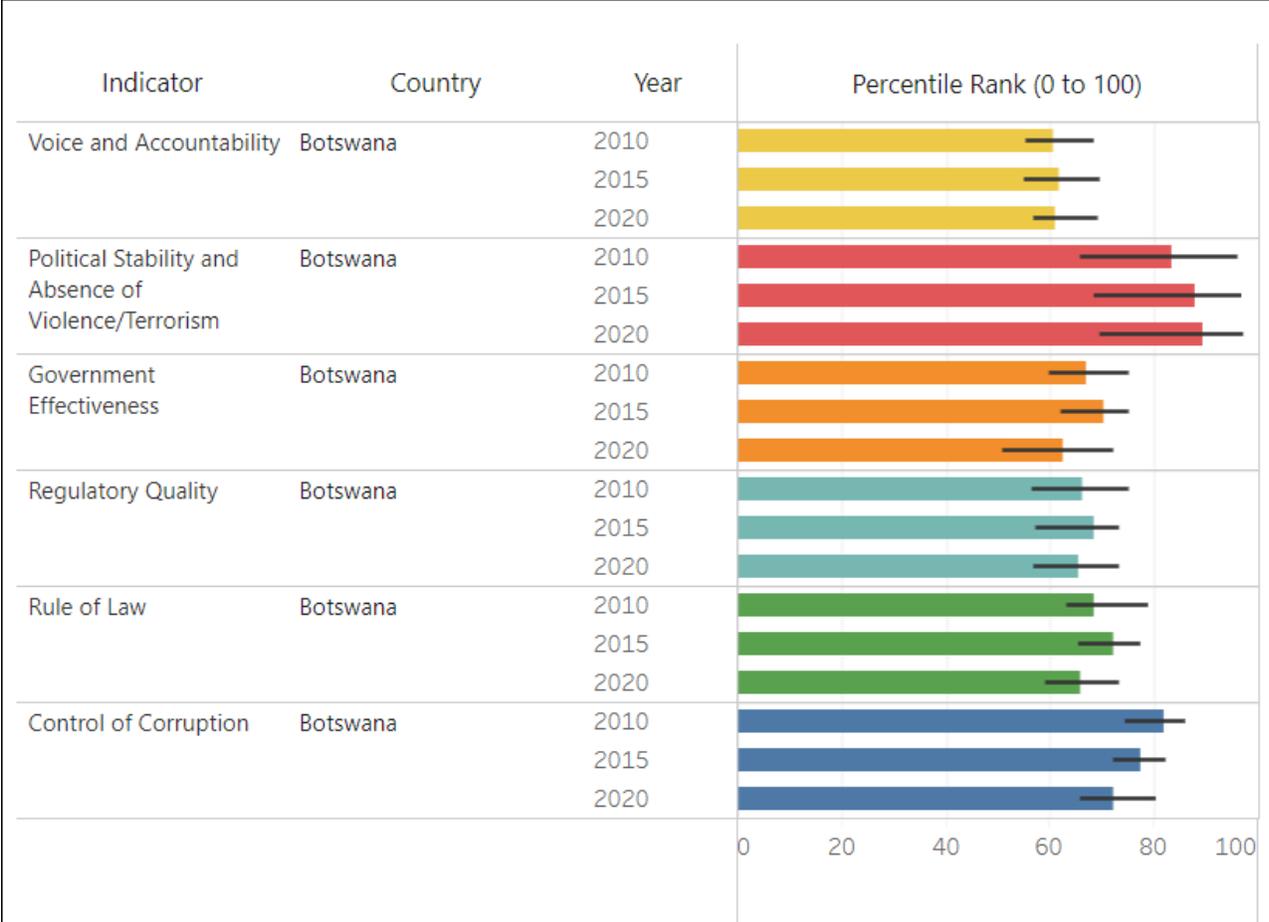
The legislative branch is a unicameral parliament consisting of the National Assembly with 63 seats. Fifty-seven members are directly elected by a single majority vote, four are nominated by the president and evaluated by simple majority votes by other assembly members, and two are considered ex-officio members (president and attorney general). An advisory body to the national assembly also exists and has 35 members. Eight are hereditary chiefs from Botswana's main tribes, 22 are indirectly elected by chiefs themselves, and an additional 5 are appointed by the president. This advisory body consults on various tribal-governmental issues, but it has no direct legislative power (CIA, 2021). As such, indigenous tribes like the San Bushmen have been historically disenfranchised by a majority-Tswana government.

Under the judicial branch, the highest courts in Botswana are the Court of Appeal and the High Court. Each consists of a chief justice and several other judges as appointed by the president and upon suggestion by the Judicial Service Commission of the parliament (CIA, 2021). The Court of Appeal is the final arbiter in all legal matters. The High Court has four total locations: Lobatse, Francistown, Maun, and headquarters in Gaborone. The High Court deals with legal cases beyond the jurisdiction of lower courts (Hierarchy of the courts, n.d.).

Botswana is Africa's longest-standing multiparty democracy. As per Worldwide Governance Indicators, Botswana ranks highly in categories such as political stability, regulatory quality, and control of corruption. Regarding civil liberties, citizens can practice any religion, freely assemble, vote in elections, and receive due process, among other liberties. Freedom of speech is protected by the constitution, but citizens can face fines from openly insulting public officials and national emblems. Public-sector workers are restricted from openly expressing political views. Additionally, the interests of certain tribal groups and LGBTQ+ people are not well-represented by public officials. These groups face social discrimination and do not attain full benefit of civil liberties. Moreover, freedom of the press has been curtailed in recent years. Under President Masisi, state-run media has faced accusations of intolerance towards the

opposition party and media harassment of opposition members. The previous Emergency Powers Act restricted media reports on COVID-19 to information only from the director of health services or the World Health Organization. This policy hindered private media’s ability to cover the COVID-19 crisis. Police harassment of private journalists has also been reported under Masisi’s administration. Furthermore, the country’s anti-corruption agency has faced allegations of bias towards the ruling party, as its head is directly appointed by President Masisi. The agency is also accused of incompetence in pursuing higher-level corruption when it occurs. This anti-corruption body has yet to investigate relevant state officials concerning the embezzlement of the National Petroleum Fund. Without freedom-of-information laws, Botswana’s anti-corruption efforts are further blunted by a lack of transparency to the public (Bertelsmann Stiftung, 2022; Freedom House, 2022). These revelations highlight decreased control of corruption in Botswana, but the country still ranks well relative to the local region.

Figure 4.
Governance Indicators for Botswana



From (Worldwide Governance Indicators, 2020)

Economy and Employment

The economy of Botswana experienced rapid growth following independence and has continued showing modest growth in recent years. Diamond mining is the primary economic driver, accounting for 25% of GDP, 85% of export earnings, and 33% of government revenues (CIA, 2021). Botswana has the greatest market value for diamond production worldwide (Process, 2021). The COVID-19 pandemic slowed economic growth by about 8.5% in 2020, but it rebounded to 12.1% in 2021. A modest growth rate of 4.1% is expected in 2022 (World Bank, 2022). Nevertheless, a diamond-driven growth model is unsustainable long-term. Tourism is a secondary economic driver. Agriculture constitutes less than one-tenth of the gross-national product due to ill-suited land, but the export of cattle-based beef to the European Union has improved over the years. Botswana's major export destinations include India, Belgium (where De Beers, the nation's primary corporate mining partner, is headquartered), the United Arab Emirates, and South Africa. Botswana's major import source is South Africa (Parsons, 2022). The national currency of Botswana is the pula.

According to the World Bank, Botswana has transformed from a low-income to an upper-middle-income country, with a GDP per capita of \$6,404.9 in 2020. Out of 190 total countries, Botswana is ranked 87th by the World Bank regarding ease of doing business. In response to the COVID-19 pandemic, the World Bank provided Botswana with a \$250 million loan in 2020 to bolster private-sector development and environmentally sustainable initiatives. The World Bank has provided other funding in the past, including \$145.5 million for a water security project. Since 2004, the United States has provided nearly \$1.1 billion to Botswana under the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) (U.S. Department of State, 2021).

In 2020, Botswana had a gross national income (GNI) of \$15.094 billion. GNI per capita was \$6,640 in 2020, reduced from \$7,510 in 2019 and a peak of \$7,700 in 2014 (likely due to COVID). These figures highlight Botswana's economy as one of the best in the region. Despite the economic expansion, unemployment remains an issue at a rate of 24.93% in 2020, disproportionately affecting the youth. Annual inflation stands at 1.89% as of 2020. Poverty has drastically reduced since independence. The latest figures report a poverty headcount ratio at \$1.90 (those who earn this amount or less in a day) of 14.5% in 2009, reduced from 17.2% in 2009 and 28.2% in 2002 (World Bank, 2022). Although unemployment and HIV/AIDS epidemics pose challenges to the economy, Botswana has experienced great economic success and is poised for additional growth.

Physical and Technological Infrastructure

Botswana's economic growth, high school enrollment level, and low levels of corruption have all contributed to substantial infrastructure development in the country. Botswana's classification as a middle-income country (MIC) in 1998 has traditionally limited concessional aid from major development banks (MDBs) and other groups. Public funding by the government accounts for the majority of infrastructure development, but external debt has increased since the 2009 financial crisis from 5% in 2005 to 11% in 2014 (Sekakela, 2018).

The government has used national development plans (NDPs) to outline public funding strategy over about 6-year periods. These plans directed resources towards necessary projects at that time. From 2003 to 2009, NDP 9 spurred the development of health care sector to combat HIV/AIDs. NDP 10 spanned from 2009 to 2016 and focused on the nation’s water and electricity needs (Sekakela, 2018). Currently, NDP 11, which began in 2017, emphasizes healthcare initiatives, development of export industries, and diversification towards a robust private sector (United Nations, 2016). Government bonds have been issued to fund the expansion of universities and creation of the country’s first medical school at the University of Botswana. Foreign aid has decreased substantially over time, but the U.S. and Japan remain the biggest donors. Most donor funds are utilized by the health and social sectors to combat HIV/AIDs. External financing for infrastructure is largely sought from MDBs, particularly the World Bank but also the African Development Fund, among others. Loans from foreign nations have decreased from 2005 to 2016, but the proportion of debt to China has increased during this time (mainly for construction services). Foreign direct investment is largely skewed towards the mining and retail industries (Sekakela, 2018).

Telecommunications

Supportive government regulation has improved telecommunication in Botswana. Primary providers include Mascom Wireless, Orange Botswana, and Botswana Telecommunications Corporation (Marketline, 2021). Botswana reported a cell phone penetration rate of 185% (as people have multiple phone numbers) in 2021, one of the highest in Africa (International Trade Administration, 2021).

Table 2.

Telecommunications Subscriptions in Botswana

Type	Number of Total Subscriptions	Subscriptions per 100 inhabitants
Telephones – landlines	142,587	5.95
Telephones - cellular	3,819,019	162.4

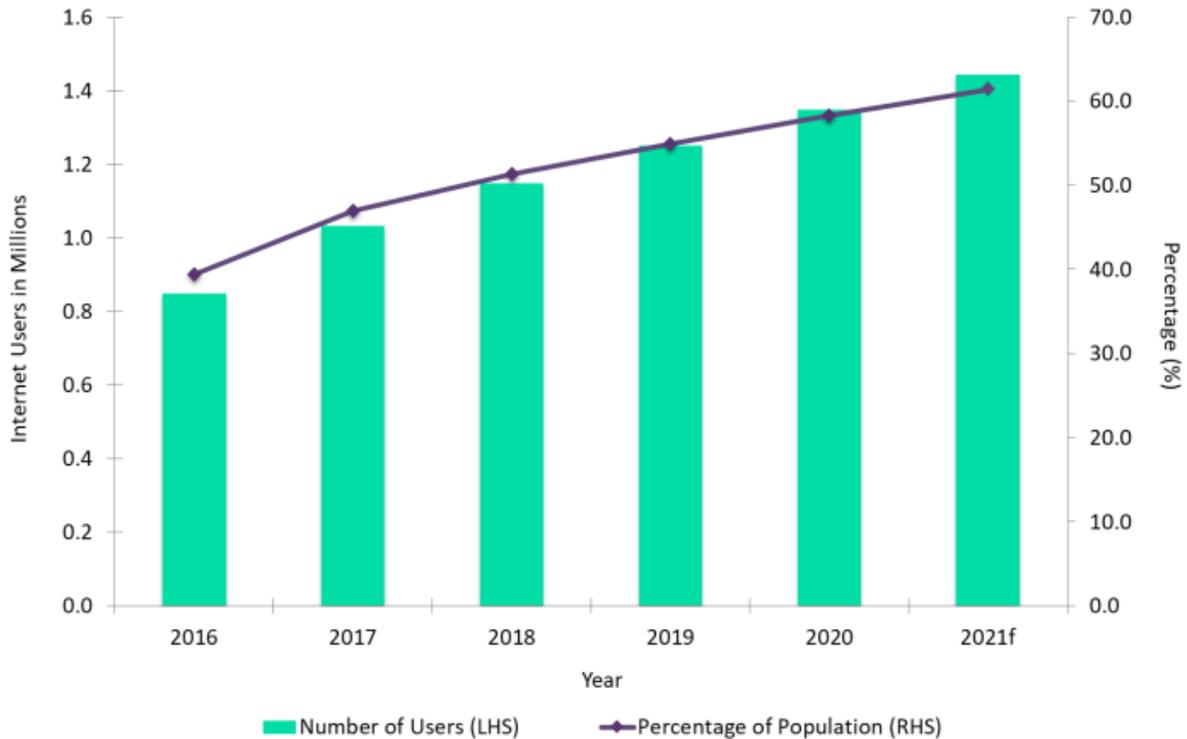
From (CIA, 2020)

Internet

Internet usage has improved largely through the proliferation of smartphones. State-sponsored development in the Botswana Fiber Network has improved access to mobile broadband and reduced prices for data packages. 3G and 4G LTE networks are available. The government has supported digital integration in schools, and COVID-19 has spurred additional Internet expansion for work-related logistics (International Trade Administration, 2021; CIA, 2021).

Figure 5.

Number of Internet Users and as a % of Population from 2016-2021



From (Marketline, 2021)

Radio and Television

Botswana has five total radio stations, all based in Gaborone. Radio Botswana and Radio Botswana 2 are state-owned, while Gabz FM, Yuma FM, and Yarona FM are privately-owned (Know Botswana, n.d.). Botswana Television is a state-owned broadcasting company that airs content locally relevant to Botswana. Programs aim to provide news, information, and entertainment. Botswana and Multichoice’s DStv are commercial services that air South African content and select foreign channels, respectively (Mosanako, 2014).

Print Media

The country has four main newspapers. The *Botswana Daily News*, published in English and Setswana, is the most popular and was established in 1964 by the government. Others include the *Botswana Guardian*, *Botswana Gazette*, and *Mmegi wa Digmang*, which are all privately owned (Press Reference, 2008). Several smaller media outlets exist that provide print and online news.

Electricity and Energy

Botswana's energy sector remains highly dependent on fossil fuels. Coal constitutes 80% of energy generation. The country's total generation capacity is 993 megawatts (MW), but only about 450 MW are available for power. Electricity imports from South Africa cover most of the additional demand. About 56% of the country has access to electricity, including 77% of urban areas and 37% of rural areas. A new multinational project, Mega Solar, aims to bring large-scale solar energy generation to Botswana and Namibia (Power Africa, 2021). On average, establishments in Botswana face about 4.1 power outages (blackouts) in a month, as per available 2010 figures (World Bank, 2022).

Water and Sanitation

Botswana has made great strides in improving water infrastructure and security. As of 2020, access to drinking water at a basic level is available in 98% of urban areas and 79% of rural areas. These levels are increased from 2015 figures, which were still high relative to some other African and Asian countries. Sanitation, which includes toileting facilities and waste management, has also improved. In 2020, 91% of urban areas have basic sanitation services. Rural areas remain a challenge, with only 52% having access to basic sanitation (WHO; UNICEF, 2021). While water pipelines are available, frequent droughts coupled with high demand depletes reservoirs and limits availability at times. Additionally, human workers are scarce, and pipes are not efficiently maintained. This human resource challenge has contributed to pipes leaking and bursting. Accordingly, improvement in reservoir systems and the quality of current infrastructure is necessary (Molokwane & Tshombe, 2017).

Transportation

As a landlocked nation, Botswana experiences logistical difficulties regarding trade across its borders. The government has supported the development of all suitable transportation infrastructure. Roadways are the major route of transport. While only a small proportion of roadways are paved, about 80% of roadways are in good or fair condition, comparable to other African MICs. One apparent problem is overengineering, where 23% of the main roads are paved but experience little traffic (less than 300 vehicles per day). More efficient allocation of resources is needed in this aspect (Briceño-Garmendia & Pushak, 2011). In total, Botswana has nearly 653,274 registered vehicles (World Health Organization, 2016).

Table 3.*Transportation Route Availability in Botswana*

	total	per 1 mio inhabitants	per km ²
Roadways	31,700 km	13,500.03 km	54.57 m
Railroads	900 km	377.61 km	1.53 m
Waterways	0 km	0.00 km	0.00 m
Commercial harbors	0	0.00	0.000
Airports	74	31.47	0.127

From (WorldData.info, 2019)

National Health Care Sector

National Health Care Profile

HIV/AIDS has long been the greatest healthcare challenge in Botswana. Despite being an upper MIC, the prevalence of HIV is around 19.9% for those aged 15-49 as of 2020. Botswana has the fourth highest prevalence of HIV in the world (World Population Review, 2022). In 2002, Botswana launched the Masa Program, the preeminent national HIV treatment initiative. Under this program, Botswana became one of the first in its region to provide free antiretroviral treatment (ART) to those with HIV. In 2019, 86% of individuals were aware of their HIV status, of which 84% were receiving active ART treatment. While the Masa Program has been successful, a shift in strategy is now necessary. Over the years, international donors have decreased funding for HIV due to Botswana's MIC status, including the United States' PEPFAR. Decreased foreign aid will place the burden for HIV funding on the government. In shifting away from donor funding, Botswana already has the proper infrastructure and treatment availability in place. Current initiatives must address bio-psychosocial issues associated with seeking HIV treatment. Community efforts must address the stigma of seeking care and integrate ART treatment at the primary care level. Moreover, as women make greater use of health services for maternal/neonatal care, they are more likely to receive treatment coverage for HIV. Future initiatives must encourage men to seek healthcare. This requires challenging social perceptions of masculinity and the tendency of men to avoid hospital services until severe illness (Ramogala-Masire, et al., 2020). Such strategies will allow HIV prevention to become sustainable as the country becomes self-reliant on healthcare funding. Overall, Botswana has successfully controlled HIV/AIDS, having reduced the total number of deaths from the disease by 29.1% between 2009 and 2019. Moving forward, the country will need to manage an aging population living with HIV in the face of other rising disease burdens (IHME, 2019).

Table 4.

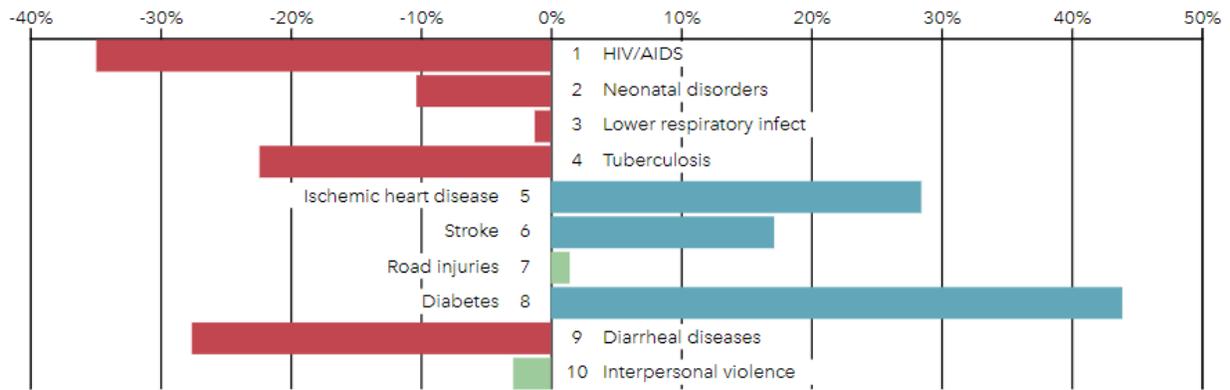
Mortality Rates of Specific Populations in Botswana

Mortality Rate	Adult Male, per 1000 adult males (2019)	Adult Female, per 1000 adult females (2019)	Infants, per 1000 live births (2020)	Maternal, per 100,000 live births (2018)
Value	247.684	160.288	36.1	158

From (World Bank, 2022)

Figure 6.

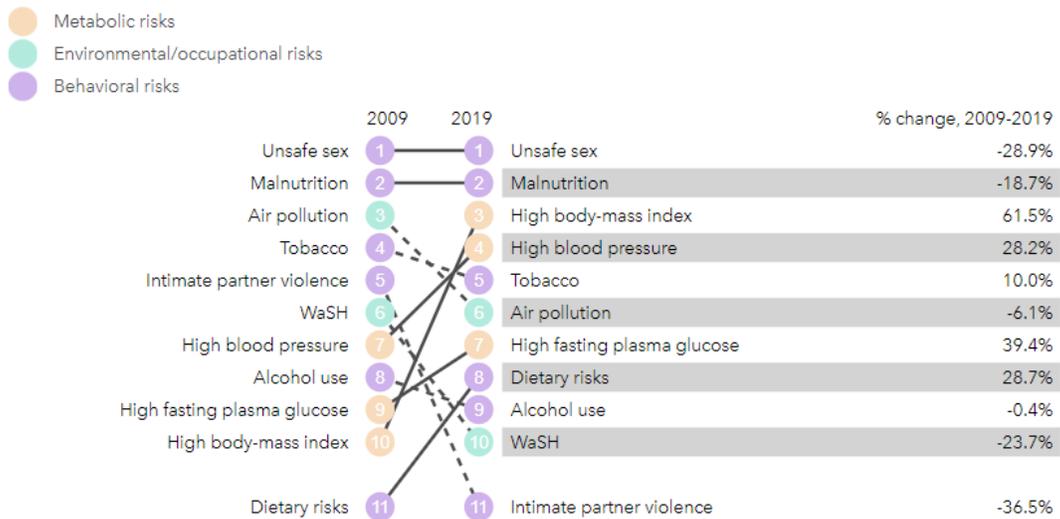
Top 10 Causes of Death and Disability (DALYs) in 2009 and % Change 2009-2019, All Ages



From (IHME, 2019)

Figure 7.

Top 10 Risks Contributing to Total DALYs in 2019 and % Change 2009-2019, All Ages



From (IHME, 2019)

While communicable diseases like HIV and tuberculosis are particularly burdensome in lower-income countries and continue to be in Botswana, the country's progress as an upper MIC has introduced new risk factors to health. The incidence of diabetes and cardiovascular disease has increased immensely over the past two decades. This is consistent with concurrent increases in the population's life expectancy. Also, health issues that are common in the African region continue to affect Botswana. During the rainy months, malaria cases increase and public health efforts (like insecticide spraying and promotion of mosquito nets) are undertaken seasonally. Occasional outbreaks of measles occur in those under the age of five. Campaigns involving measles immunization and vitamin A treatment are launched annually as well (Tapera, Moseki, & January, 2018). Despite Botswana's economic growth, malnutrition continues to be a problem among children, with about 31% of children experiencing stunting (UNICEF, 2020). Neonatal and maternal issues also remain troubling in Botswana. In 2019, the highest cause of maternal mortality was "genital tract and pelvic infection following abortion and ectopic/molar pregnancy" (Statistics Botswana, 2019). While access to health facilities is adequate, the quality of existing services is low, and there is a lack of skilled professionals. As such, some gestational women die within health facilities, unlike other nations where death occurs externally (WHO Africa, 2018). For similar reasons, cases of cancer and associated syndromes have also risen. Patients often present with late-stage disease. Health facilities often have insufficient resources for cancer screening and treatment, as well as knowledge about management (Das, 2022). Overall, while access to healthcare has improved in Botswana, there is a drastic need for trained physicians. In response, the government recently created a medical school at the University of Botswana in 2009. Still, appropriate training programs and national licensing for certain medical specialties are either rudimentary or lacking entirely.

National Health Care Structure

Health System Structure and Policy

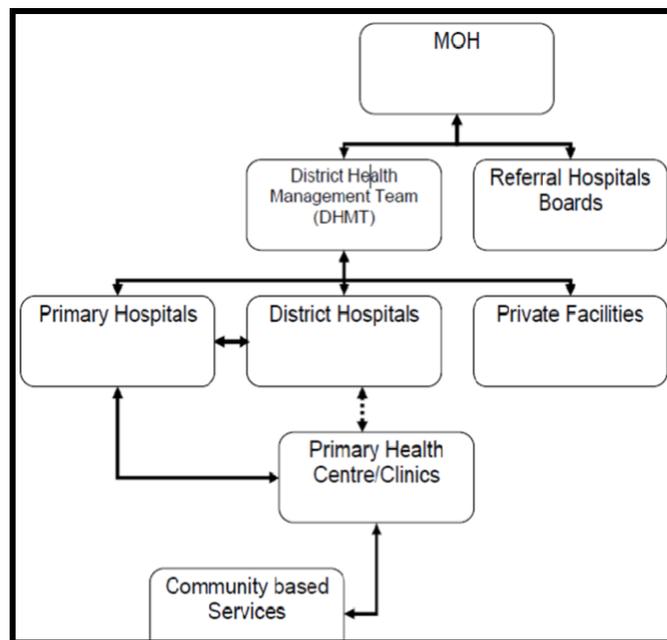
The country is divided into twenty-seven health districts. The government of Botswana, via the Ministry of Health and Wellness (MoH), provides nearly-free universal healthcare to all citizens of the country. The MoH operates 26 public hospitals throughout the country. There are 16 primary hospitals located in smaller villages that provide limited inpatient services. There are 7 district hospitals found in major villages. Three referral hospitals (two general and one psychiatric) exist to provide specialized care in the largest cities of Gaborone and Francistown (Seitio-Kgokgwe, Gauld, Hill, & Barnett, 2014). In collaboration with the Ministry of Local Government, the MoH has also established numerous health facilities in the form of 101 inpatient clinics, 171 clinics without beds, 338 health posts, and 844 mobile clinics, all of which coordinate primary care services for a region. Apart from public facilities, a complementary network of private facilities also provides care (Tapera, Moseki, & January, 2018). Not including public mobile clinics, the private sector operates 40% of healthcare facilities in Botswana (United States Agency for International Development, 2013). Private providers can include companies, physicians, religious organizations, and non-profit organizations. Overall, around

84% of the population is within 5 kilometers of a health facility (Seitio-Kgokgwe, Gauld, Hill, & Barnett, 2014).

For Botswana citizens and permanent residents, a user fee of 5.00 pula (US \$0.45) covers access to public health care for three months and includes unlimited consultations. Non-citizens and patients with private insurance are charged 80.00 pula (US \$7.50) per consultation, along with additional fees depending on services (Pagiwa, Shiell, Barraclough, & Seitio-Kgokgwe, 2021). Depending on the severity of presentation, diagnostic tests required, and necessary management, patients can be treated anywhere from local clinics to a major referral hospital. If required services are not available at public facilities, the government will pay the cost of treatment to private providers or those abroad. Surgery, for example, is heavily performed by physicians working in the private sector. About 83% of the population relies on the public health system, representing those without private insurance. While access to public care is extensive, the quality of care is hindered by multiple factors. Difficulties in sustaining human resources are evident and arise from a lack of skilled laborers in the country. The lack of trained doctors and nurses exemplifies this limitation. There are only 0.34 doctors and 2.73 nurses per 1,000 patients. This shortage primarily affects the public sector. Until recently, most doctors are trained abroad, and many citizens of Botswana with international medical education do not return home. Among those that do return, the majority choose to work in the private sector alongside foreign physicians from countries like India and China. Although the University of Botswana graduated its first medical school class in 2014, demand in the public sector still vastly outweighs supply. Moreover, reductions in PEPFAR funding and increases in non-communicable diseases have impacted patient management such that the public sector is underfunded and underprepared (Kramer, Haupt, Coetzer, & von Blomberg, 2014).

Figure 8.

Hierarchical Diagram of Patient Referral Between Healthcare Facilities in Botswana



From (Botswana Ministry of Health, 2010)

Health Service Coverage

17% of the general population is covered by private insurance, and 42% of employed people have private insurance coverage (Mbogo & McGill, 2016). The three largest insurance schemes (BPOMAS, BOMaid, and Pula) make up 88% of private coverage (United States Agency for International Development, 2013). BPOMAS is available to government workers and is the largest single private scheme. As private insurance is expensive and requires employment, poor households are less likely to be covered by these medical aid schemes. These individuals must resort to public-sector facilities, which may be ill-equipped and have long waiting times. To capture a greater segment of the population, medical insurance coverage must be expanded, and more efficient public-private cooperation must occur.

During the 2007/2008 and 2009/2010 fiscal years, hospital curative services (provided when a patient presents with illness) accounted for 53% of total health expenditure, while preventive health services made up only 9% (Mbogo & McGill, 2016). In the 2019/2020 fiscal year, the clinical services department of the MoH accounted for 83% of recurrent payroll expenses, while public health and AIDS prevention combined for 3.5% (UNICEF, 2020). These figures highlight the public sector's inefficient prioritization of transient clinical treatments over population-based prevention.

Private-sector healthcare in Botswana has played a small but increasingly critical role in healthcare delivery. Public-private partnerships (PPP) have allowed for efficient supply-chain developments concerning the provision of ART for HIV. By waiving import taxes, dissuading markups via medical aid scheme reimbursements, and encouraging healthy competition, the government helps keep costs down and allows for ART to reach uninsured patients through private-sector channels. Such partnerships will remain essential in addressing an overburdened public health sector (Kramer, Haupt, Coetzer, & von Blomberg, 2014).

Private-sector healthcare includes wholesalers, laboratories, pharmacies, hospitals, surgeons, and general practitioners, among others in the supply chain. In Botswana, private-sector services (apart from non-profits and religious organizations) have traditionally only been available to those with stable employment and higher incomes. Since most private health facilities are near urban centers, healthcare resources are often concentrated away from rural areas where they could provide the most benefit. In Gaborone, oversaturation of private-sector general physicians and underemployment of nurses is seen adjacent to understaffed public health facilities (United States Agency for International Development, 2013). Such discrepancies underscore the importance of more efficient human resource management and public-private cooperation. As PEPFAR and other donor funding decreases, PPPs will become increasingly necessary to control HIV spread and expand medical coverage overall.

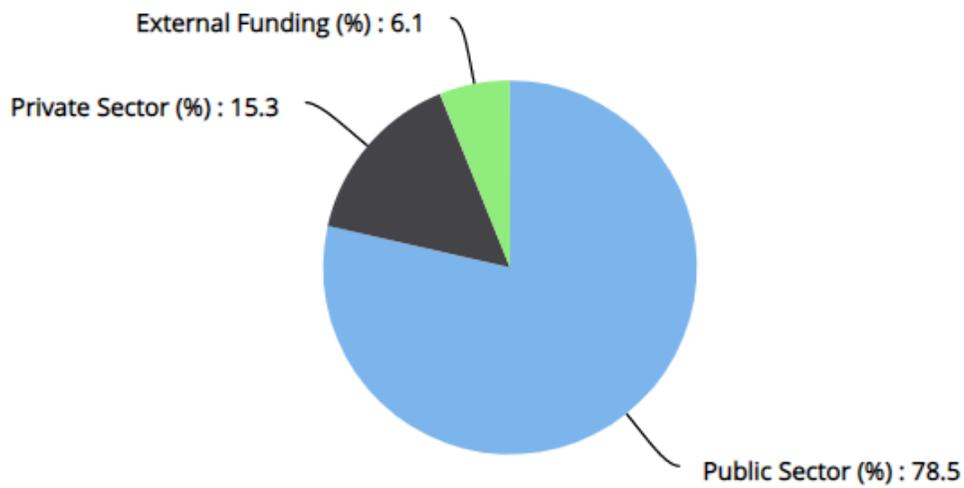
Healthcare Expenditures

In 2019, Botswana's current health expenditure as a percentage of GDP was 6.048% (World Bank, 2022). This includes public and private sector spending, as well as donor funds. Public-sector funds are secured through taxes and mining revenues. Public health expenditure has increased over the years and represented 78.5% of total healthcare spending in 2019. In the same year, private-sector spending made up 15.3% of health expenditure, reduced from 24% in

2012 (Kramer, Haupt, Coetzer, & von Blomberg, 2014). This change is likely due to substantially greater public-sector spending rather than true reductions in the private sector.

Figure 9.

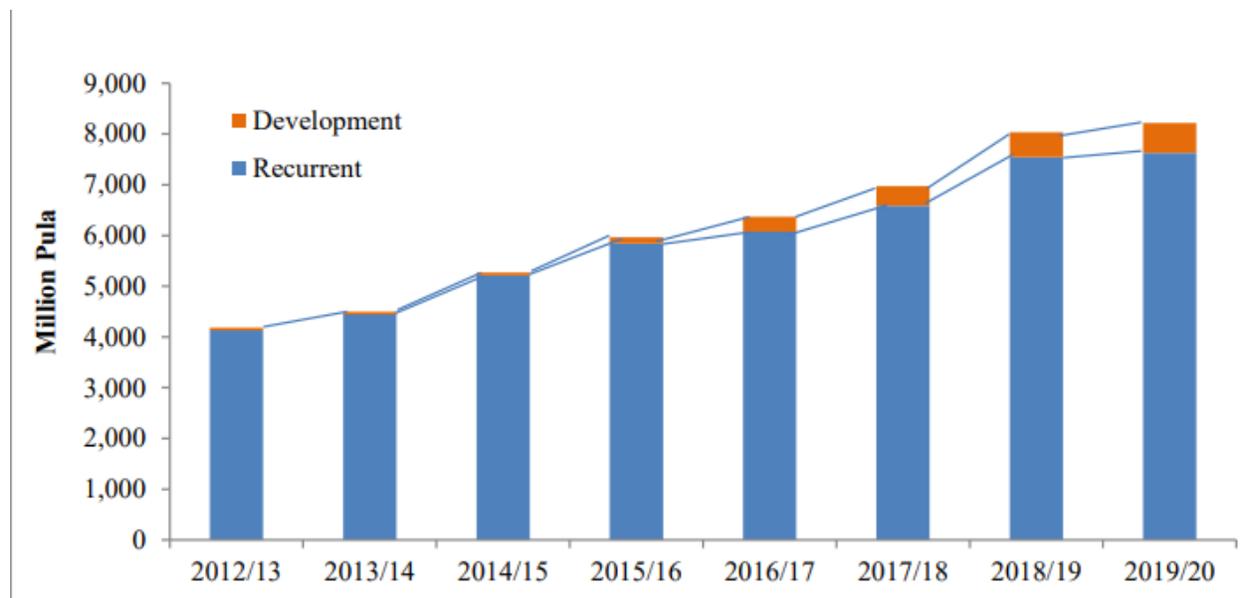
Sources of Total Health Expenditure in Botswana



From (World Bank, 2019)

Figure 10.

Amount of Health Expenditure by the Ministry of Health from 2012-2020



From (UNICEF, 2020)

Figure 11.

Sources of Spending in the Private Health Sector



From (Kramer, Haupt, Coetzer, & von Blomberg, 2014)

Health Workforce and Infrastructure

The government of Botswana directs the healthcare system through the Ministry of Health and Wellness (MoH). The MoH is responsible for coordinating national healthcare plans and large-scale public health efforts. It is the premier authority on healthcare matters, managing all public hospitals and providing regulatory oversight to the private sector. The MoH also maintains the University of Botswana Medical School and its new teaching hospital, Sir Ketumile Masire Teaching Hospital (SKMTH), created in 2014. Residency programs have been established in internal medicine, pediatrics, public health, anesthesia, emergency medicine, family medicine, and pathology (Mokone, et al., 2014). The MoH also coordinates with the Ministry of Local Government and Rural Areas to implement health initiatives and establish necessary infrastructure.

Table 5.

Numbers of Hospital Beds and Healthcare Workers in Botswana

Statistic	Hospital Beds, per 1000 people (2010)	Community Health Workers, per 1000 people (2009)	Nurses and Midwives, per 1000 people (2012)	Physicians, per 1000 people (2018)	Specialist Surgical Workforce, per 1000 people (2014)
Value	1.8	0.083	2.852	0.289	3.64

From (World Bank, 2018)

National Radiology Profile

Radiology Workforce and Training

The radiology workforce has a very limited presence in Botswana. Exact numbers are difficult to find. One paper reports the presence of only three radiologists spread out between public referral hospitals in Francistown and Gaborone (Ncube, Mars, & Scott, 2020). This number is corroborated by Dr. Abass Noor, a program manager for RAD-AID Botswana, who was on-site in the country from January to February 2022. All radiologists have trained abroad, and at least two of the public-sector radiologists are foreign nationals. A fourth radiologist is assigned to SKMTH (Sir Ketumile Masire Teaching Hospital - medical school teaching hospital). SKMTH finished construction in 2014 but has not opened in any sufficient capacity due to political reasons. It has only served in a limited capacity to manage COVID patients. A fifth radiologist, Dr. Wallace Miller, is the radiology department chair at the University of Botswana Medical School. Dr. Miller is a RAD-AID partner and has been spearheading the development of a radiology residency program in the country. The number of private-sector radiologists is unknown but is likely also limited. The use of teleradiology is more active in the private sector (Noor, 2022).

The numbers of ancillary staff in the form of radiographers and sonographers are also sparse. In the public sector, Princess Marina referral hospital in Gaborone has 3 radiographers and 3 sonographers, often acting with shared responsibility. Nyangabgwe referral hospital in Francistown has 2 individuals in each role. SKMTH is assigned 2 radiographers and 1 sonographer. Some large district hospitals also maintain radiology workers. Letsholathebe II Memorial Hospital in Maun has 2 radiographers and 1 sonographer. Mahalapye District Hospital has 1 individual in each role. Outside of these hospitals, the exact number and distribution of radiology staff across public and private hospitals is unknown. Additionally, the public sector has no interventional radiology capabilities. There is one interventional radiologist in the private sector, and very few image-guided procedures are performed overall. There are no IR technologists in the public sector. There are only two radiation oncologists, one at Princess Marina and the other at SKMTH. One medical physicist is also located at SKMTH (Noor, 2022).

Currently, there is no residency training program for radiology in Botswana. No national licensing process exists, and all radiologists working in Botswana have trained abroad. Oftentimes, trained radiologists are unavailable, and physicians without radiology training are left to interpret imaging. While these physicians can read images at a basic level, radiologists are better able to identify key radiographic findings (Fawole, et al., 2020). There are also no training programs for radiographers and sonographers. No national certification process exists for these roles. All training for technologists is completed mostly in Zambia or Zimbabwe (Noor, 2022). Accordingly, educational programs in radiology are necessary for the sustainability of a radiology workforce in Botswana. Temporary solutions include training general practitioners to interpret basic imaging to help with clinical diagnosis (Fawole, et al., 2020). Additionally, recruiting more foreign radiologists to not only serve in a clinical capacity but also teaching

capacity (by educating nurses, radiographers, general practitioners, and medical students) is another possible option. Teleradiology is extensively used in the private sector, where picture archiving and communication systems (PACS) are available, like at Sidilega Private Hospital in Gaborone. The use of hard copy plain films and lack of PACS limits teleradiology implementation in public hospitals. Using mobile smartphones to send pictures of plain films for interpretation abroad is one simple but resourceful possible solution (Schwartz, et al., 2014; Mehta, 2015). Long-term sustainability requires the development of radiology residency and other professional certification programs. An education pipeline of motivated and skilled youth is pertinent to this goal.

Equipment Inventory, Distribution, and Rules and Regulations

Radiology equipment is concentrated at the two referral hospitals in Francistown and Gaborone, two large district hospitals in Maun and Mahalapye, and SKMTH. Imaging modalities in Gaborone and Francistown include ultrasound, radiography, and CT. These modalities are also available in Maun and Mahalapye. Additionally, Princess Marina Hospital in Gaborone has digital fluoroscopy. SKMTH has all the previously mentioned modalities and is the only public-sector hospital with MRI capabilities. However, SKMTH does not yet offer any modalities for outpatient services, and patients must be referred to the private sector for MRI exams. Certain private-sector hospitals have MRI alongside all other techniques (Noor, 2022). Fluoroscopic “C-arm” was recently introduced at Sidilega Private Hospital, and fluoroscopy may have a limited presence elsewhere in the private sector (Banda, 2022). There are limited PET capabilities in Botswana. Across both the public and private sectors, it is difficult to know the exact quantities of each type of imaging modality and their distribution. Regarding PACS, SKMTH is the only government hospital with a Fujifilm Synapse system that is hosted on local servers. Without outpatient imaging, this PACS remains unused. Across public hospitals, insufficient Internet access and lack of computers preclude the effective use of radiology services (Noor, 2022).

The MoH is responsible for procuring medical equipment used in public facilities. There are no local imaging technology manufacturers. For the large government hospitals and private hospitals, x-ray, ultrasound, CT, and MRI machines are sourced from foreign vendors. For CT and MRI, scanners produced by General Electric, Agfa and Siemens are imported from South Africa. The MoH imports Mindray ultrasound machines and Samsung portable x-ray machines from South Africa, as well as Omnipaque and Isovue contrast media and Bayer MedRad injectors. China is the second-largest source of imported imaging equipment and supplies. Across public medical facilities, imaging equipment is mostly new. 64-slice CT scanners were installed in Maun, Francistown, and Gaborone public hospitals in 2018 and SKMTH in 2019. A new digital radiography system was installed at Princess Marina hospital in 2019. At public facilities, older x-ray units were converted from analog to digital systems through computed radiography. Plain film radiography is not used. Also, few imaging equipment are donated to public medical centers. However, some computers and monitors may be donated by non-governmental organizations (Noor, 2022).

In Gaborone, certain companies provide equipment installation and maintenance for imaging equipment. The company Leading Edge Markets (LEM) reports a 60% market share in this space. This company has provided installation and technical support services for MRI and multi-slice CT scanners at SKMTH. LEM also provides these services for Princess Marina hospital and various private hospitals (Leading Edge Markets, 2022). Because federal maintenance standards for imaging equipment require Botswana-based companies to perform repairs, LEM and other companies in Gaborone often act as middlemen. They provide maintenance work through contracts forged with South African repair companies and their employees. This is because many technicians for General Electric and Siemens scanners are based out of South Africa (Noor, 2022).

For Princess Marina hospital, the most common imaging exams and their frequency are provided in Table 6. These numbers are likely comparable at the Francistown referral hospital and lower at the Maun and Mahalapye district hospitals. In the public sector, unquantifiable amounts of x-ray and ultrasound equipment are seen at smaller regional hospitals and medical centers. Across all medical facilities in Botswana, ultrasound is the most common imaging examination (Noor, 2022). In the public sector, the use of ultrasound can be limited by scarce supplies like sonography gel. Medical facilities farther from Gaborone are disproportionately affected. In such cases, K-Y Jelly from local pharmacies can be used as a temporary, creative alternative (Mehta, 2015). Digital radiography is the second-highest ordered exam. CT is the third most frequent examination, but it is only available at large government hospitals. In non-urgent cases, wait times for CT scans at public hospitals can be weeks to months (Mehta, 2015; Noor, 2022). At public hospitals, PACS infrastructure is nonexistent. Digital radiographs and CT scans are thus burned to discs and given to patients, who are responsible for their own imaging. For both CT and x-ray, redundant imaging can occur if patients lose their disc copies. Moreover, radiologists are rarely available to interpret images. As such, discs must be delivered by courier to the referral hospitals for interpretation, a process that can take several weeks (Noor, 2022; Edwards, 2022).

Table 6.

Most Common Imaging Exams and Frequency at Princess Marina Referral Hospital

Modality	Daily Maximum	Annual Volume
Digital Radiography	121	29,177
Ultrasound	41	9,903
CT	18	4,300
Digital Mammography	10	840
Digital Fluoroscopy	3	400

From (Noor, PMH PACS and Informatics Readiness Assessment, 2022)

The MoH is the national regulatory body for medical imaging equipment in Botswana. For imaging technology, the MoH has developed national standards pertaining to radiology services and equipment operation (Ministry of Health, 2014). However, infrequent equipment

maintenance, supply-chain issues, and lack of quality management protocols hamper proper regulation of imaging technology (Seitio-Kgokgwe, Gauld, Hill, & Barnett, 2014). While standards are defined, the MoH provides little oversight or enforcement. These issues again stem primarily from human-resource challenges in the public sector.

Conclusion

Botswana is a middle-income country with promising economic indicators and a burgeoning national healthcare system. The creation of the University of Botswana Medical School shows the government's commitment to sustainable education of medical professionals. Changes in the disease landscape and an overburdened public sector underscore the need for trained physicians and private-sector cooperation. Initiatives such as the Botswana-UPenn Partnership and the Botswana Global Health Program at Beth-Israel Deaconess Medical Center provide a foundation for global health radiology efforts. The development of radiology residency and technologist programs are key current goals. Moving forward, radiology efforts should occur in parallel to human resources development in the public sector. Organizations and individuals can get involved by teaching and training healthcare professional students in Botswana, whether online or in-person. For example, the RAD-AID learning center provides free online education for radiology professionals covering an array of topics. For other interested organizations, new institutional partnerships with Sir Ketumile Masire Teaching Hospital can also allow for education initiatives to occur. These initiatives would educate motivated individuals in radiology, who can then helm the development of self-sustainable technologist and radiology residency programs. Across public medical facilities, the implementation of PACS is another primary objective. By expanding internet infrastructure to regional sites outside Gaborone, PACS can be installed at distant medical centers to improve patient-care coordination. PACS can serve a teaching function as well by acting as a library of cases for medical students, residents, and technologists to learn from. To help implement PACS, global health organizations can lobby the Ministry of Health to invest in advanced internet and computing capabilities. Companies and individuals with experience in cloud-based PACS can also lend technical expertise as Botswana moves to implement this system. Through these avenues and others, global health radiology can play a critical role as Botswana continues its progress in healthcare and beyond.

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