Enhancing Healthcare Accessibility in Nairobi, Kenya

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1.Business Understanding

1.1 Overview

The third Sustainable Development Goal is focused on ensuring healthy lives and promoting well-being for all at all ages. It proposes to end the preventable death of newborns, infants and children under five (child mortality) and end epidemics. Under the goal, the United Nations set 13 targets to help reach this goal of promoting good health and well-being like achieving universal health coverage, supporting research, development and universal access to affordable vaccines and medicines, etc. These targets are indicators for measuring the success of the goal.

The goal is to achieve universal health coverage and equitable access of healthcare services to all.

1.2 Problem Statement

Recent evidence suggests the Kenyan healthcare system performs poorly as anywhere between 20% and 50% of the resources devoted to health in Kenya are used inefficiently. This inefficiency significantly hampers healthcare accessibility and quality, particularly in Nairobi, Kenya.

1.3 Objectives

The objective is to create client value by addressing the challenge of enhancing healthcare accessibility in Nairobi through data analysis and providing actionable recommendations.

Specific Objectives

- Conduct exploratory data analysis to gain a comprehensive understanding of the vaccination rates.
- Perform statistical analysis and identify patterns, trends and within the data and derive meaningful insights.
- Create informative visualisations and present the insights in an understandable manner.
- Give sensible recommendations based on findings discovered when analysing the data.

1.4 Project Plan

- I used Python on Jupyter Notebook and Tableau for my data analysis
- Reading material and research to understand the state of healthcare in Kenya
- Derivation of meaningful insights using visuals and statistics

2. Data Understanding

This section is broken down into tasks that included;

1. Collection of the Initial Data
2. Data Description
3. Data Cleaning; to make the dataset understandable and easy for data analysis
4. Exploratory Data Analysis

2.1 Overview

Two datasets were provided. The first dataset on healthcare facilities, this data was collected from between October 2015 and November 2023. The data will be extracted from the [opendataAfrica website](#), an API is provided to extract the data for an analysis. The data includes a comprehensive list of health facilities in Kenya, complete with services offered as well as granular geo-data (Provincial, County, District, Location, Sub-Location and Division information)

The second dataset presents the distribution of enumerated population by single year and five-year age groups, sex and administrative unit (county and sub-county). The data was provided the Kenya National Bureau of Statistics(KNBS) from Kenya's 6th National Census i.e. The 2019 Kenya Population and Housing Census.

I then imported the necessary libraries for loading of the dataset using the API; *requests, json and pandas*

2.2 Data Description

This is the overall understanding of the data, how many instances there are and descriptive statistics.

The data included information about the administrative unit like the county and the constituency of the healthcare facility, the facility name, number of beds and cots, whoever is in charge and their title, whether they open 24 hours and over the weekends, the facility's operational status and the services offered.

The dataset on the population included information on the county, sub-county, the age and gender and number of people in these respective domains.

I then categorised the data to only display information of those facilities in Nairobi.

After doing a descriptive analysis, the data included information on 942 facilities across 17 constituencies.

3. Data Preparation

This is the actual preparation of the data to allow data analysis, it involves data cleaning and formatting to ensure the Validity, Accuracy, Completeness, Consistency and Uniformity of the Data.

To ensure consistency and uniformity, this will include checking for missing and duplicate values. There were some missing values in the first dataset. However, these entries were retained in the analysis due to concerns regarding the potential loss of pertinent information. There were neither missing nor duplicated instances in the second dataset on population.I did not need to do any formatting of the column names because of the sufficient information provided.

2.4. Data Analysis

I explored the data using both the Jupyter notebook and Tableau.
In Jupyter Notebook, I divided it into three sections;
1. Univariate Analysis
2. Bivariate Analysis
3. Multivariate Analysis

Univariate Analysis

The purpose of the univariate analysis is to understand the distribution of values for a single variable.
- I started by checking the count of the type of healthcare facilities in Nairobi. The type of healthcare facilities with the high number is the medical clinics(460), followed by dispensaries(199)
- I checked the owners of these facilities; Most of the healthcare facilities in Nairobi are owned by private enterprises(219), followed by Private Practice - General Practitioners(161), and the Supreme Council for Kenya Muslims(2) own the least number of facilities.
- Examined the column on Operational status of these facilities and we uncovered that 917 facilities are operational, 19 are not and 6 are pending opening.
- The various services offered by facilities across Nairobi include;

  - IPD: Inpatient Department (also known as hospitalization or admission)
  - FP: Family Planning
  - HBC: Home-Based Care
  - ART: Antiretroviral Therapy (typically for HIV/AIDS treatment)
  - C-IMCI: Community-based Integrated Management of Childhood Illnesses
  - OPD: Outpatient Department (or Clinic)
  - TB TREAT: Tuberculosis Treatment
  - TB LABS: Tuberculosis Laboratory Services
  - TB DIAG: Tuberculosis Diagnosis
  - RHTC/RHDC: Reproductive Health Training Center/Reproductive Health and Development Center
  - RAD/XRAY: Radiology and X-ray Services
  - PMTCT: Prevention of Mother-to-Child Transmission (of HIV)
  - OUTREACH: Outreach Services (providing healthcare outside of the healthcare facility)

- ANC: Antenatal Care
- GROWM: Growth Monitoring
- EPI: Expanded Program on Immunization
- CEOC: Clinical Emergency Obstetric and Newborn Care
- CAES SEC: Caesarean Section Services
- BLOOD: Blood Transfusion Services
- BEOC: Basic Emergency Obstetric Care
- HCT: HIV Counseling and Testing
- YOUTH: Youth Health Services

The services that are offered by most healthcare facilities is Inpatient Care(IPD-297) followed by Family Planning(280). Other services offered are Home-Based Care(250), Antiretro Treatment(109) and C-IMCI: Community-based Integrated Management of Childhood Illnesses(72)

- Healthcare facilities that are open 24 hours: 199
  Healthcare facilities that are open on weekends: 516

- Total number of beds in healthcare facilities: 7336.0
 Total number of cots in healthcare facilities: 1086.0

Bivariate Analysis

We use Bivariate analysis for the analysis of two variables.
- The biggest facilities are 'Other Hospital' and National Referral Hospital
  Some facilities have no beds nor cots like dental and eye clinics

Distribution of Beds and Cots by Type of Healthcare Facility
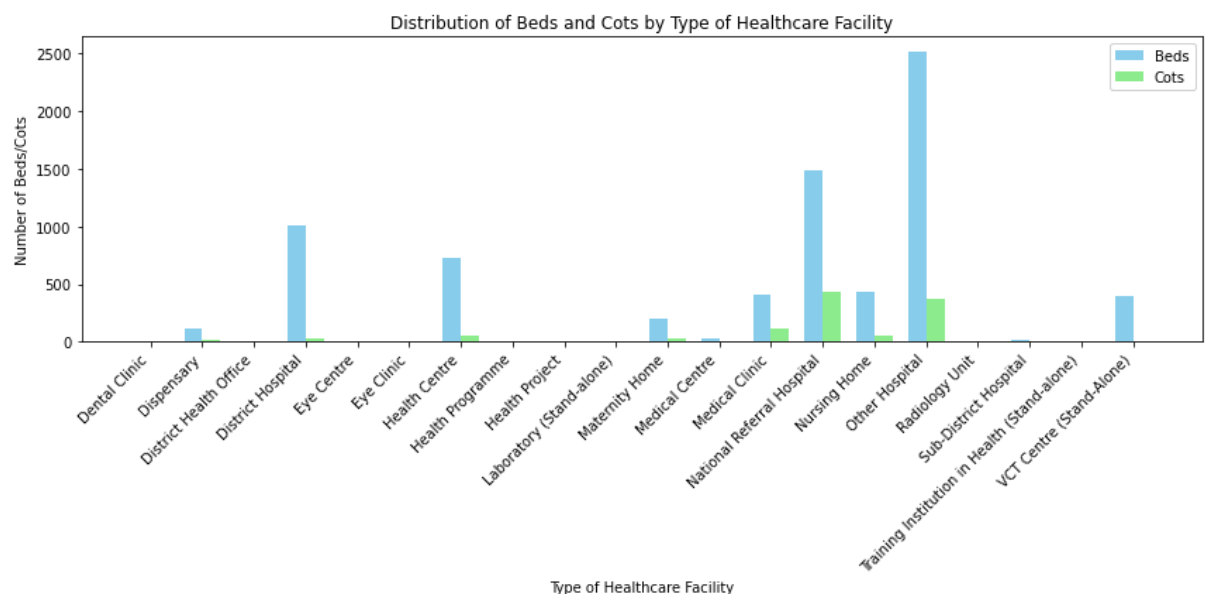
- Most services are offered by the dispensaries and medical clinics

- Starehe has the most healthcare facilities

Distribution of Healthcare Facilities by Constituency
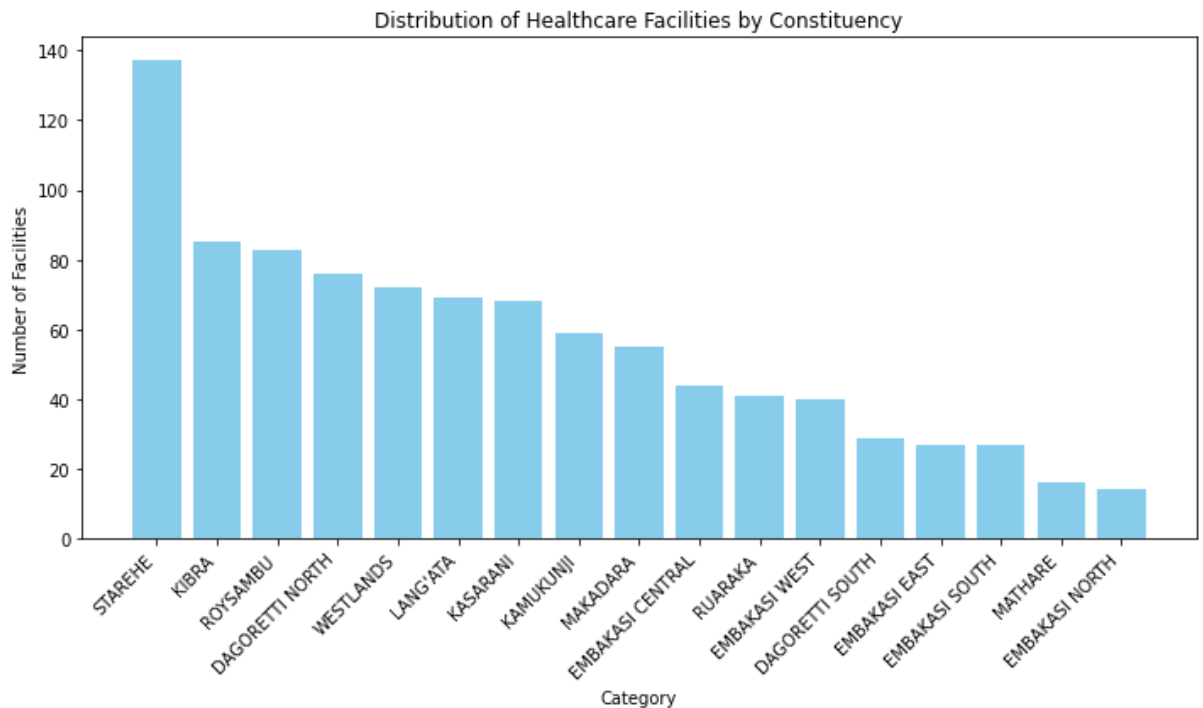
- Starehe has the most operational facilities, Royssambu has the most non-operational facilities and Kibra has the most facilities pending opening.
- Most of the healthcare facilities in Nairobi are owned by private enterprises.
- Some medical clinics are owned general practitioners
- Medical Centres and Dispensaries have both the most operational and non-operational facilities.
Private institutions have the most operational and non-operational facilities.
- Non-governmental organisations and the Ministry of Health have the highest number of facilities that are pending opening

Multivariate Analysis

The analysis of more than two or all variables and checking how they are correlated.
- Many healthcare facilities that open over the weekend are bigger (have more beds and cots) than those that open for 24 hours

Presence of Beds and Cots in Healthcare Facilities by Facility Hours
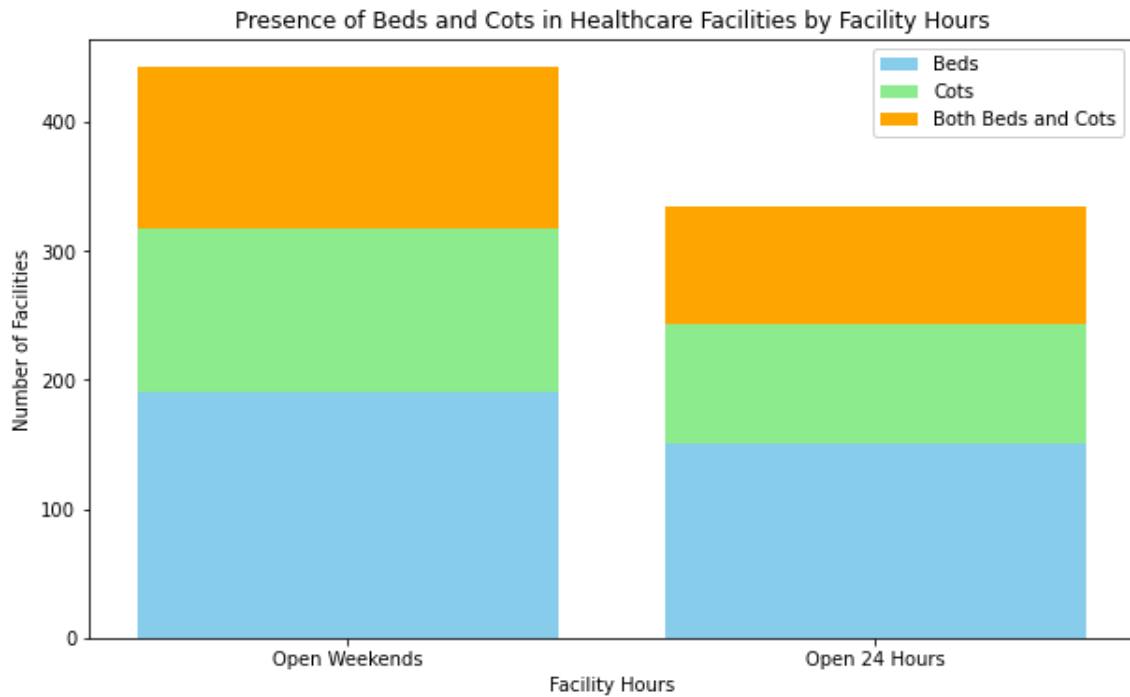
- Kamukunji constituency has the biggest facilities whereas Embakasi North has the smallest.
  Langata and Mathare have no cots at all

Average Number of Beds and Cots per Constituency
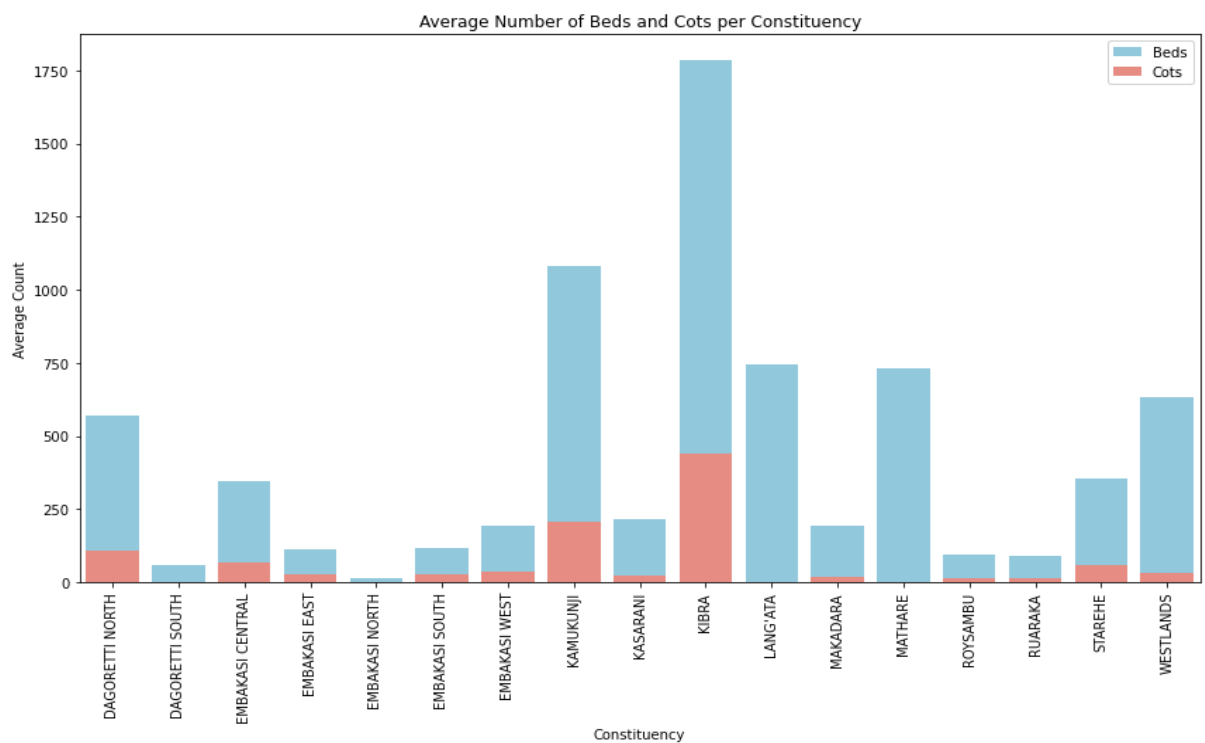
- Every constituency has a medical clinic, Starehe has the most and Mathare has the least.
  * Followed by a dispensary, Kibra has the most whereas Embakasi Central has none.
  * Only Starehe(9) and Dagoretti North(1) have a dental clinic.
  * The only constituencies that have a laboratories are Kibra(5), Starehe(7) and Westlands(1)
  * The only radiology unit is in Starehe
  * There are only 2 National Referral Hospitals in Kibra and Dagoretti North
  * Many of the healthcare facilities are found in Starehe Constituency
  * Embakasi North has the least number of healthcare facilities

Count of Different Types of Facilities in Each Constituency
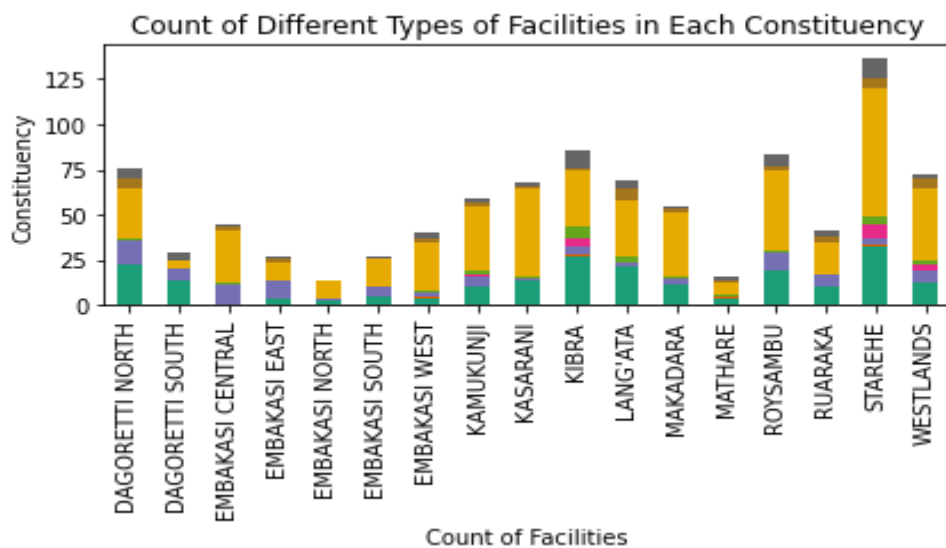
- Most of Nairobi's population lives in Westlands constituency and the constituency with the least is Dagoretti

Total Population by Sub-County in Nairobi
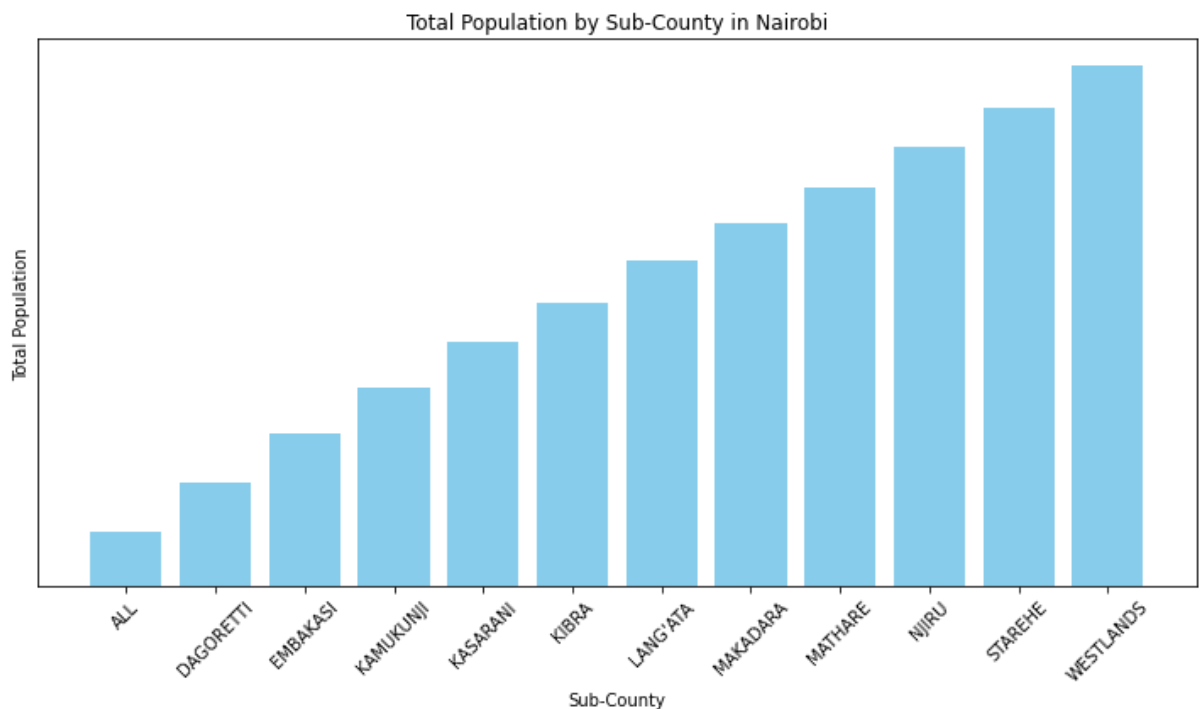
3. Insights

General Knowledge about Kenya

Kenya is in East Africa bordering Uganda to the West, Tanzania to South and Ethiopia and Sudan to North.
Kenya has 47 counties and Nairobi is the capital. Nairobi county has 17 constituencies.
According to the 2019 census, Nairobi had a population of 4,396,828; 2192452 Female and 2204376 Male. Majority of this is youth.
The chart below shows a distribution of the population of Nairobi among age-groups
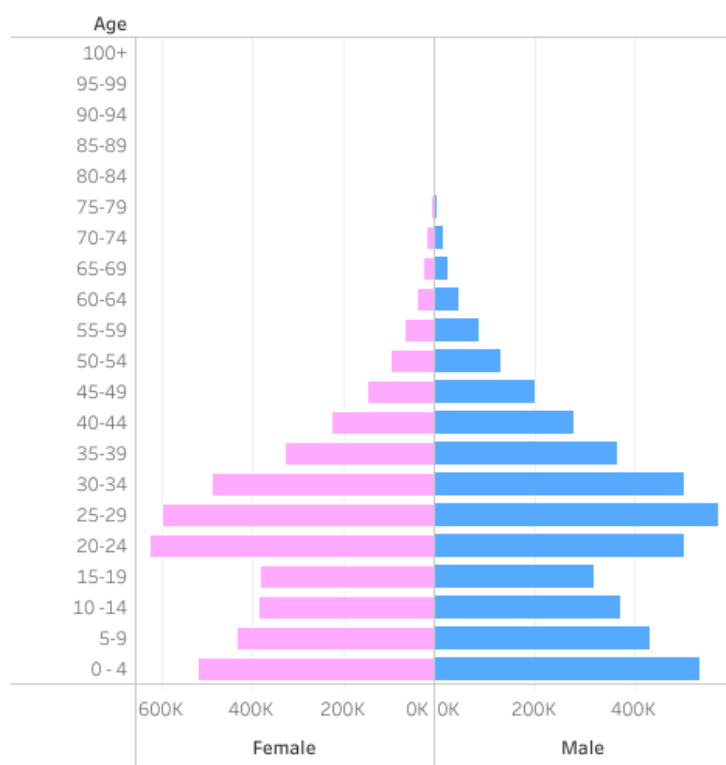
Insights

In more recent years, the push towards UHC in Kenya gained momentum as the Kenyan president made UHC a central objective of his administration through his pledge to make quality healthcare services available to all Kenyans by the year 2022. While his swift actions were lauded by many, including the Director-General of the WHO, critics argued the healthcare system was unprepared for the sudden influx of patients seeking care at public healthcare clinics—leading to reported delays in care and shortages of drugs. These problems were compounded by ongoing healthcare worker strikes that demanded back pay and promotions and ultimately led to growing anxiety and low morale among healthcare workers.

A sizable portion of Kenya's population is at risk of not receiving high-quality healthcare since the country's healthcare system falls well short of both national objectives and Sustainable Development Goal 3.

★ The data analysis has pointed out a number of things about healthcare in Nairobi, Kenya.

Distribution of Healthcare Facilities:
- The bulk of Nairobi's healthcare facilities are medical clinics and dispensaries, suggesting a focus on primary healthcare delivery.
- The majority of healthcare facilities are owned by private companies, indicating that the private sector plays a major role in the provision of healthcare.
Many certified professionals start their own medical clinics in their communities in addition to their full-time jobs to supplement their income.
The national and local governments have not made investing in and constructing functional healthcare facilities a priority. The facilities that are not operational or pending opening are owned by the Ministry of Heath.

Accessibility and Service Hours:
- A substantial proportion of healthcare facilities operate on weekends, indicating efforts to improve accessibility outside traditional working hours.
- However, the percentage of facilities open 24 hours is relatively low, highlighting potential gaps in round-the-clock healthcare provision.

Geographical Distribution:
- Starehe constituency hosts the highest number of healthcare facilities, while Embakasi North has the least. This may be because the Central Business District is in Starehe constituency and many facilities are located here. Embakasi North is located in the Eastlands where more vulnerable Kenyans live.
These Disparities in healthcare facility distribution may affect accessibility for residents in certain areas like the people from Embakasi North

4.Recommendations

Here are some suggestions that will enhance the quality and accessibility of healthcare services in Nairobi that align with the SDG3: Universal Health Coverage

Prioritising healthcare workers:
Acknowledging the work of healthcare workers and advocating for fair treatment in salary and wages, good working environment and recognition.
Training and Education of healthcare workers to be emphasised and recognising the challenges that they face like burnout and stress, exposure to health risk, long working hours and heavy workload.

Equitable Distribution:
Explore strategies to ensure a more equitable distribution of healthcare facilities across all constituencies, especially those with fewer resources. Like the constituencies that are in the Eastlands need to be prioritised.

Enhanced Services:
Expand the range of services offered across healthcare facilities, particularly in areas with high demand but limited availability, such as dental and laboratory services.
This might also include extending operational hours to improve access to emergency and after-care services to people.

Public-Private Partnerships (PPPs):
Foster collaboration between public and private sectors to leverage resources and expertise for improving healthcare infrastructure and service delivery.

Community Outreach:
Implement community outreach programs to raise awareness about available healthcare services and promote preventive care measures, especially in underserved area

Infrastructure Investment:
Invest in infrastructure development, including the provision of additional beds and cots in healthcare facilities to accommodate growing healthcare demands.
Prioritising resource allocation and investment in infrastructure based on population density and healthcare needs of a particular constituency.

Continuous Monitoring and Evaluation:
Establish mechanisms for ongoing monitoring and evaluation of healthcare facility performance and accessibility to inform evidence-based decision-making and resource allocation.

Promoting Mental Wellness:
Post pandemic, part of the SDG3 is promoting mental wellness. This might be in the form of raising awareness on the importance of taking care of one's mental health. Moreover, encouraging youth to join the wellness career path and becoming psychologists and promoting mental wellness.

5.Conclusion

In conclusion, the exploration and analysis of the data highlight the urgent necessity of combined endeavours to improve healthcare accessibility. The analysis indicates disparities in the facility distribution, service availability, and operational capacity across different constituencies in Nairobi and by focusing on these areas, stakeholders can make sure that their efforts have the most effect and that resources go where they are most needed. The recommendations will help stakeholders make smart decisions on how to allocate resources where they are most needed and make the system more efficient and accessible.

Moving forward, collaborative efforts with the government, non-governmental organisations, and the community are essential in addressing these challenges and promoting equity in accessibility of healthcare aligning with the third Sustainable Development Goal of promoting universal healthcare and well-being.

The journey towards enhancing healthcare accessibility in Nairobi must be guided by a commitment to fairness, compassion, and solidarity, ensuring that no one is left behind in the pursuit of better health and well-being for our communities.