DATA VISUALIZATION PROJECT

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INTRODUCTION

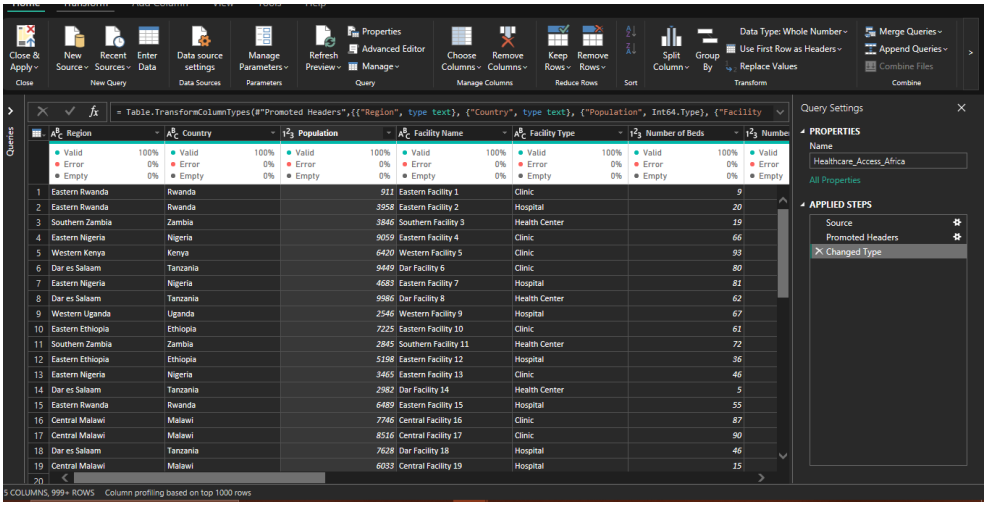
This report provides a comprehensive analysis of healthcare facility distribution and funding efficiency using Power BI. The goal is to identify disparities, optimize funding allocation, and improve healthcare access through data-driven insights**.**

Data Preparation and Transformation

The dataset was uploaded into Power Query for cleaning and preprocessing. Columns were checked for consistency and completeness to ensure accuracy in analysis.

Uploading Data to Power Query

The dataset was uploaded to Power Query for necessary transformations. This process ensures the data is clean and structured for analysis.



Column Check

A thorough column check was conducted to validate data types and ensure there were no missing values. This step guarantees data integrity and accuracy before further processing.

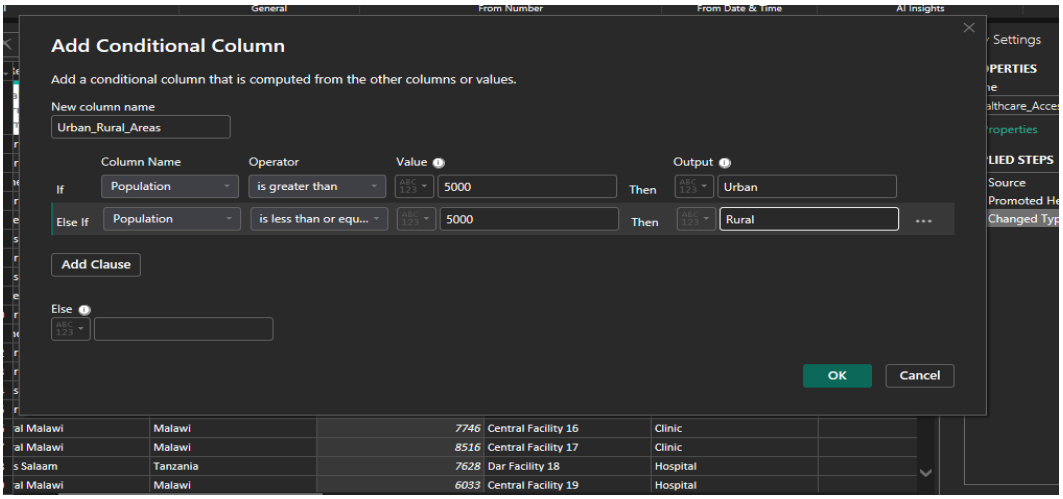
- **Conditional Column**: Urban vs. Rural Classification

A new conditional column was created to categorize areas based on funding received:

≤ 5000 → Rural

> 5000 → Urban

This classification enables a clearer analysis of healthcare accessibility in different regions.



- **Funding Level Classification:**

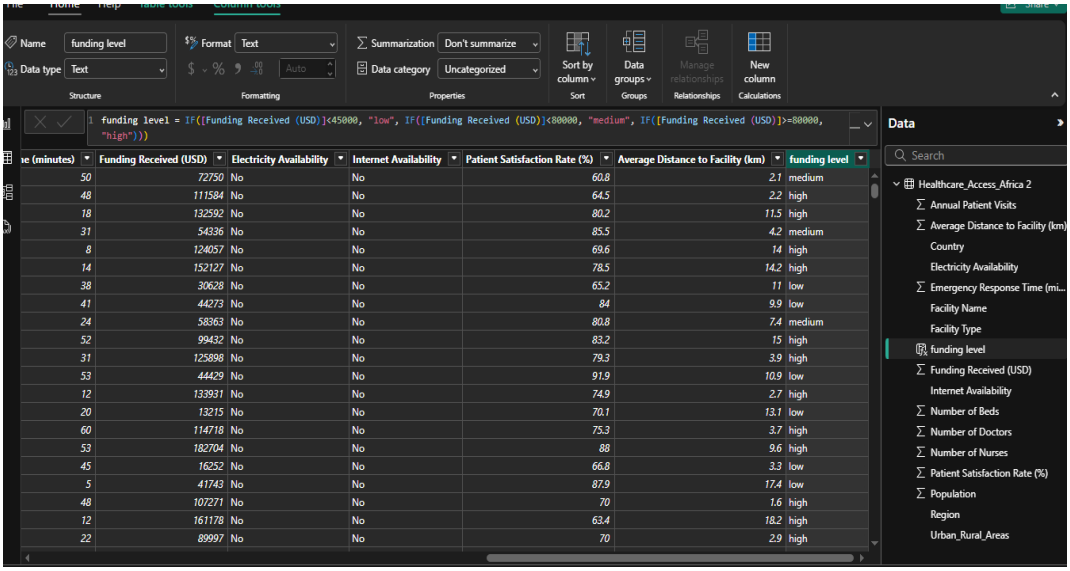
A calculated column was introduced to categorize funding levels:

Low: Funding Received (USD) < 45,000

Medium: Funding Received (USD) < 80,000

High: Funding Received (USD) ≥ 80,000

This classification provides insights into how funds are distributed across healthcare facilities.



...e (minutes)	Funding Received (USD)	Electricity Availability	Internet Availability	Patient Satisfaction Rate (%)	Average Distance to Facility (km)	funding level
50	72750	No	No	60.8	2.1	medium
48	111584	No	No	64.5	2.2	high
18	132592	No	No	80.2	11.5	high
31	54336	No	No	85.5	4.2	medium
8	124057	No	No	69.6	14	high
14	152127	No	No	78.5	14.2	high
38	30628	No	No	65.2	11	low
41	44273	No	No	84	9.9	low
24	58363	No	No	80.8	7.4	medium
52	99432	No	No	83.2	15	high
31	125898	No	No	79.3	3.9	high
53	44429	No	No	91.9	10.9	low
12	133931	No	No	74.9	2.7	high
20	13215	No	No	70.1	13.1	low
60	114718	No	No	75.3	3.7	high
53	182704	No	No	88	9.6	high
45	16252	No	No	66.8	3.3	low
5	41743	No	No	87.9	17.4	low
48	107271	No	No	70	1.6	high
12	161178	No	No	63.4	18.2	high
22	89997	No	No	70	2.9	high

- **Funding Efficiency Classification**

A calculated column was introduced to measure funding efficiency, which is determined as:

Funding Efficiency =Total of Funding Received (USD) / Total of Annual Patient Visits

This metric helps evaluate how effectively healthcare facilities utilize their funding based on the number of patients they serve.

Higher funding efficiency suggests that a facility can serve more patients per dollar spent, indicating better resource utilization.

Lower funding efficiency may indicate higher costs per patient visit, possibly due to specialized care, infrastructure limitations, or operational inefficiencies.

This classification provides insights into how well different healthcare facilities optimize their funding relative to patient volume.

```
funding efficiency = DIVIDE(SUM(Healthcare_Access_Africa[Funding Received (USD)]), SUM(Healthcare_Access_Africa[Annual Patient Visits]), 0)
```

Region	Country	Population	Urban_Rural Areas	Facility Name	Facility Type	Number of Beds	Number of Doctors	Number of Nurses	Annua
Eastern Nigeria	Nigeria	9059	Urban	Eastern Facility 4	Clinic	66	17	19	
Western Kenya	Kenya	6420	Urban	Western Facility 5	Clinic	93	20	15	
Dar es Salaam	Tanzania	9449	Urban	Dar Facility 6	Clinic	80	6	50	
Eastern Ethiopia	Ethiopia	7225	Urban	Eastern Facility 10	Clinic	61	6	21	
Central Malawi	Malawi	8516	Urban	Central Facility 17	Clinic	90	12	5	
Western Uganda	Uganda	5465	Urban	Western Facility 20	Clinic	59	11	24	
Dar es Salaam	Tanzania	9059	Urban	Dar Facility 30	Clinic	20	10	38	
Central Senegal	Senegal	5048	Urban	Central Facility 39	Clinic	61	15	29	
Central Senegal	Senegal	5646	Urban	Central Facility 48	Clinic	84	6	32	
Dar es Salaam	Tanzania	6338	Urban	Dar Facility 56	Clinic	12	4	34	
Western Uganda	Uganda	6453	Urban	Western Facility 57	Clinic	41	5	42	

- **Availability Type Classification:**

A calculated column was introduced to categorize healthcare facility access based on electricity and internet availability:

Electricity & Internet: Facilities with access to both electricity and internet.

Electricity Only: Facilities with electricity but no internet access.

Internet Only: Facilities with internet but no electricity access.

No Access: Facilities lacking both electricity and internet.

This classification provides insights into the digital and energy infrastructure gaps within healthcare facilities, helping identify areas that need infrastructure investment to improve service delivery.

Name: availaibilty type | Format: Text | Summarization: Don't summarize | Sort by column | Data groups | Manage relationships | New column

Data type: Text | Data category: Uncategorized

Structure | Formatting | Properties | Sort | Groups | Relationships | Calculations

```
availaibilty type = IF(Healthcare_Access_Africa[Electricity Availability]="yes" && Healthcare_Access_Africa[Internet Availability]= "yes",
"Electricity & Internet", IF(Healthcare_Access_Africa[Electricity Availability]="yes", "Electricity Only", IF(Healthcare_Access_Africa
[Internet Availability]="yes", "Internet only", "No Acccess")))
```

ling Received (USD)	Electricity Availability	Internet Availability	Patient Satisfaction Rate (%)	Average Distance to Facility (km)	Funding level	availaibilty type
$196,483	Yes	Yes	83.7	19.1	high	Electricity & Internet
$89,079	Yes	Yes	79.3	8.3	high	Electricity & Internet
$167,998	No	Yes	61.6	8.6	high	Internet only
$123,518	Yes	No	83.3	2.5	high	Electricity Only
$192,374	Yes	No	64.7	15.8	high	Electricity Only
$105,009	Yes	Yes	69.4	17.1	high	Electricity & Internet
$111,584	No	No	64.5	2.2	high	No Acccess
$82,165	Yes	No	71.7	17.3	high	Electricity Only
$132,592	No	No	80.2	11.5	high	No Acccess
$124,057	No	No	69.6	14	high	No Acccess
$164,676	Yes	No	84.5	3.5	high	Electricity Only
$152,127	No	No	78.5	14.2	high	No Acccess
$92,079	No	Yes	89.7	7.5	high	Internet only
$99,432	No	No	83.2	15	high	No Acccess
$149,342	Yes	No	82.7	3.7	high	Electricity Only

Key Business Questions

1. **How Does the Distribution of Healthcare Facilities Compare Between Rural and Urban Regions?**

Chart type: stacked bar chart

X- Axis: count of facility type

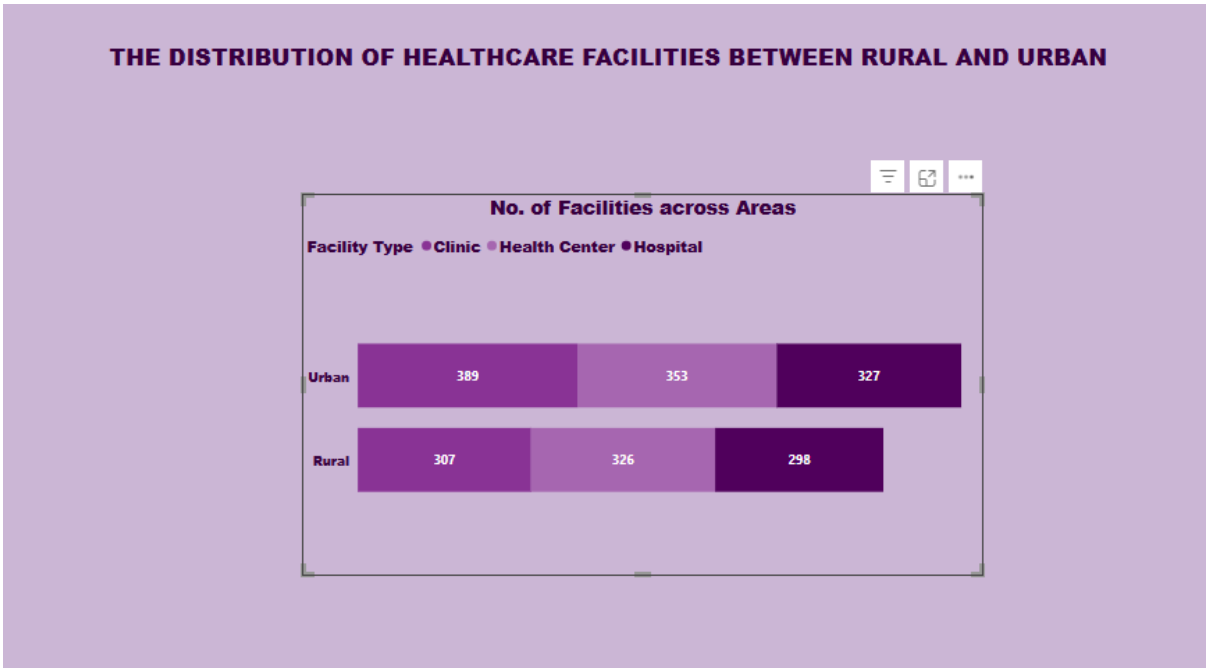
Y- Axis: urban_rural areas

Legend: facility type

Analysis

- Urban areas have more healthcare facilities than rural areas.
    - Clinics: Urban (389) vs. Rural (307)
    - Health Centers: Urban (353) vs. Rural (326)
    - Hospitals: Urban (327) vs. Rural (298)

- Urban populations have better access to specialized medical services, whereas rural areas rely more on primary healthcare. The higher concentration of hospitals in urban areas indicates potential challenges for rural residents in accessing advanced medical care. To bridge this gap, investing in more rural hospitals and strengthening existing health centers can improve healthcare accessibility and equity across regions.



2. Are Urban Healthcare Facilities Receiving More Funding Than Rural Ones?

Chart Type: Donut Chart

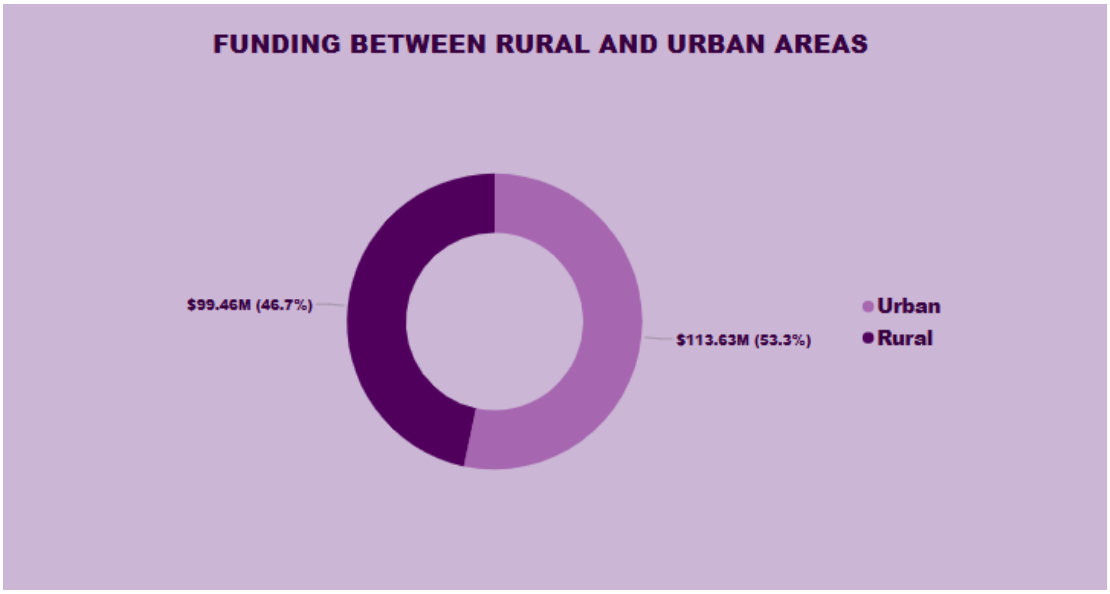
Legend: Urban and Rural Areas

Values: Total Funding Received (USD)

Analysis

The chart shows how healthcare funding is shared between urban and rural areas. Urban healthcare facilities receive **53.3%** of the total funding, while rural facilities get **46.7%**. This means urban areas receive slightly more funding than rural areas.

The small difference suggests that funding is somewhat balanced, but urban areas may still have an advantage. This could be due to higher population levels, better infrastructure, or more demand for healthcare services in cities. This suggests an effort to bridge rural healthcare gaps.



3. **Are Healthcare Facilities with Higher Funding More Likely To Have Shorter Emergency Response Times?**

Chart Type: Clustered Column & Line Chart

X-Axis: Facility Type (Clinic, Health Center, Hospital)

Left Y-Axis: Sum of Funding Received (USD)

Right Y-Axis: Average Emergency Response Time (minutes)

Analysis

This chart compares the funding received by different facility types and their corresponding emergency response times.

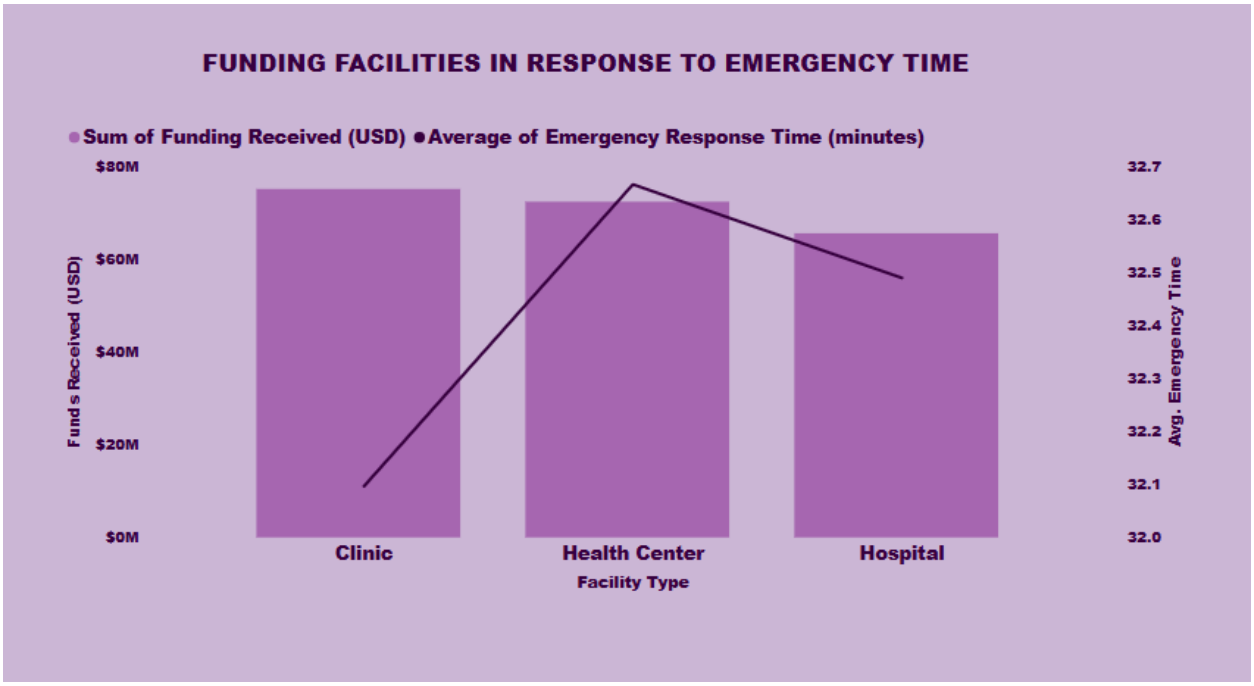
- **Funding Distribution**: Clinics, Health Centers, and Hospitals receive nearly equal funding, with each category approaching the $70M–$80M range.

- **Response Time Trends:** Clinics have the fastest response time (~32.2 minutes), despite receiving similar funding to other facilities.

Health Centers show the longest response time (~32.7 minutes), indicating possible inefficiencies despite their high funding levels.

Hospitals have a moderate response time (~32.5 minutes), suggesting that while they handle more complex cases, they are still more efficient than **Health Centers**.

The key takeaway is that higher funding does not necessarily correlate with faster emergency response times. **Clinics**, with comparable funding, manage to respond more quickly, indicating that operational factors such as location, facility capacity, or resource management could be influencing response efficiency. This suggests that improving logistics, staffing, and emergency response infrastructure—rather than just increasing funding—may be the best approach to reducing response times.



4. Which Facility Types (Hospitals, Clinics, Health Centers) Show The Highest Efficiency in Terms of Funding Per Patient Visit?

Chart Type: Scattered Plot Chart

X-Axis: Annual Patient Visit (millions)

Y-Axis: Funds Received (USD)

Legend: Facility Type (Clinic, Health Center, Hospital)

Analysis

This chart illustrates the funding efficiency of different healthcare facilities by comparing funds received to annual patient visits.

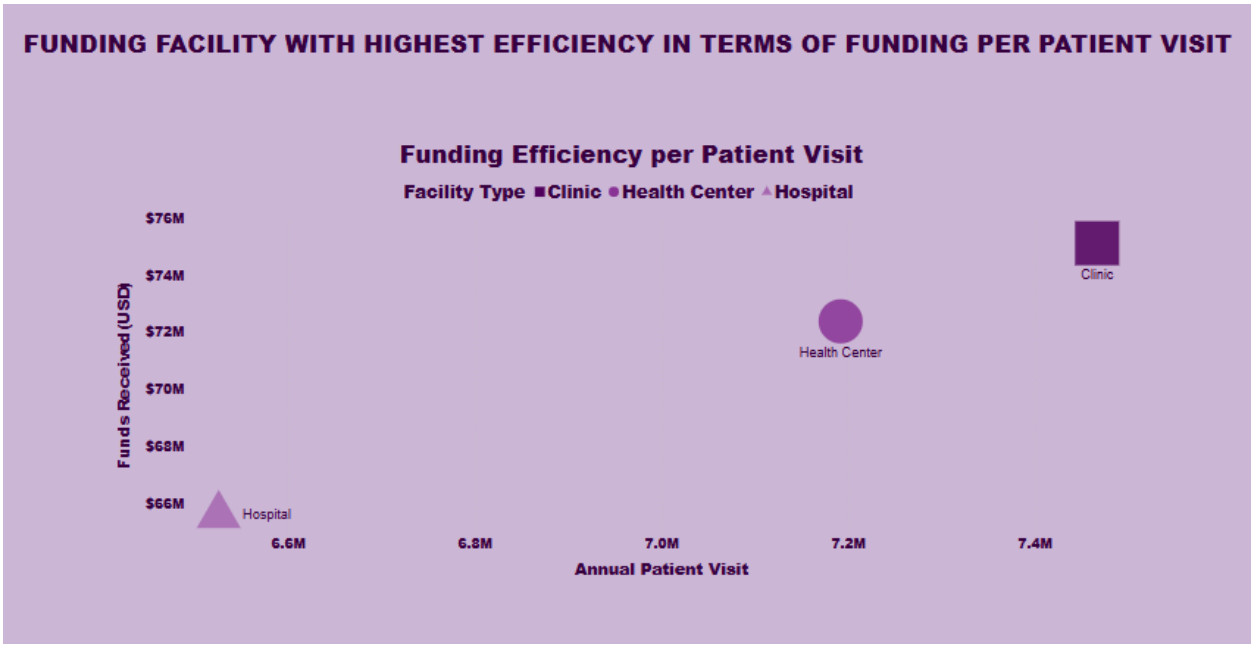
Clinics have the highest efficiency, receiving approximately $74M while serving 7.4M patients, making them the most cost-effective facility type.

Health Centers receive around $72M for 7.2M patient visits, showing slightly lower efficiency than clinics.

Hospitals have the lowest efficiency, receiving about $66M while handling only 6.6M patient visits.

Clinics appear to maximize patient reach per dollar spent, making them the most efficient facility type in terms of funding per visit. Conversely, hospitals, despite receiving substantial funding, serve fewer patients, potentially due to higher treatment costs, specialized care, or longer patient stays.

This suggests that increasing operational efficiency in hospitals and health centers could optimize healthcare resource utilization.



Actionable Insights for Stakeholders

5. **What Are the Critical Factors Preventing Equal Access to Healthcare Across Different Regions?**

Chart Type: Heat map

Columns: Electricity & Internet, Electricity Only, Internet Only, No Access

Rows: Regions

Analysis

This heat map visualizes healthcare facility access to electricity and internet across different regions, highlighting infrastructure gaps.

Regions with the highest infrastructure gaps:

- Eastern Rwanda (63%) has the highest percentage of healthcare facilities with no access to electricity or internet.

- Central Senegal (57%) and Southern Zambia (56%) also have significant infrastructure deficits.

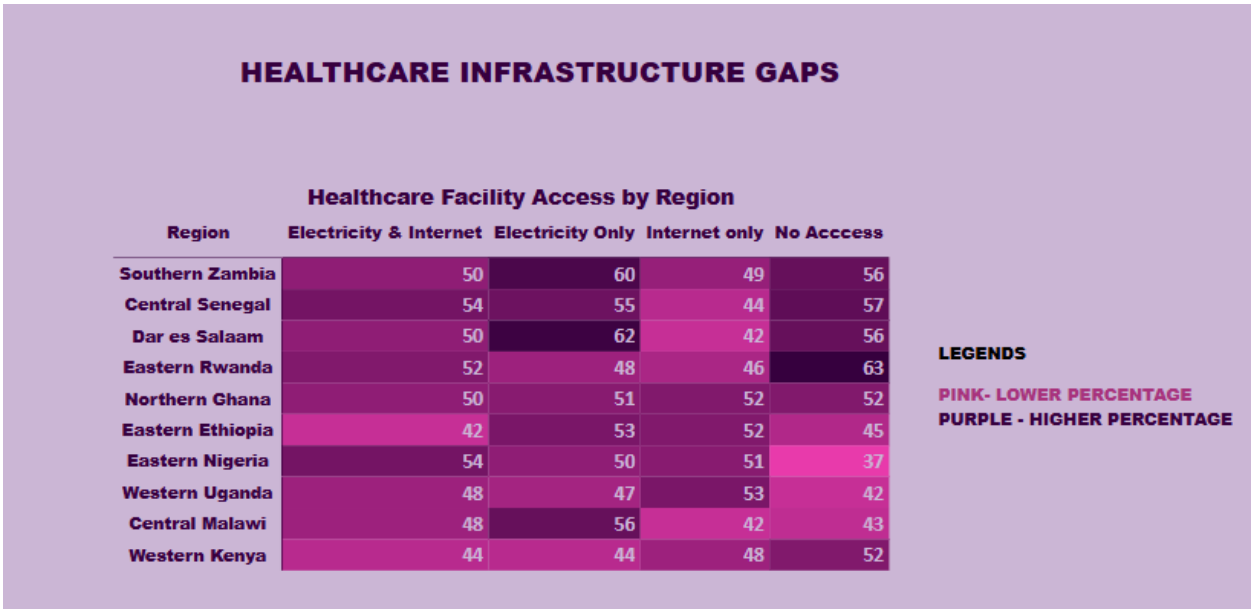
Regions with better access:

- Eastern Nigeria (37%) has the lowest percentage of facilities with no access, suggesting relatively better infrastructure.
- Dar es Salaam (62%) and Central Malawi (56%) have the highest proportion of facilities with electricity only, indicating a partial infrastructure presence but a lack of internet access.

Balanced infrastructure regions:

Most regions have similar levels of electricity & internet access, with percentages ranging from 42% to 54%. However, a considerable portion still lacks full access.

The heat map reveals that internet access is a major limitation in many healthcare facilities, affecting digital record-keeping, telemedicine, and emergency response coordination. Addressing these infrastructure gaps—especially in Eastern Rwanda, Central Senegal, and Southern Zambia—could significantly improve healthcare service delivery.



6. Which Policy Recommendations Can Be Made to Bridge the Gap Between Urban and Rural Healthcare Services?

The analysis of healthcare access in Africa, based on funding distribution, facility efficiency, infrastructure gaps, and availability types, highlights several key challenges. To bridge the urban-rural healthcare gap, the following policy recommendations should be implemented:

a) Increase Rural Healthcare Investment

The funding distribution shows that urban areas receive slightly more funding than rural areas **(53.3% vs. 46.7%),** which indicates a need for greater financial support for rural healthcare. The number of healthcare facilities in rural areas **is lower than** in urban areas across clinics, health centers, and hospitals, further reinforcing the need for increased investment. Investment should focus on building new facilities, upgrading existing ones, and providing essential medical equipment to improve healthcare service delivery in rural communities.

b) Mobile Clinics & Telemedicine Expansion

Infrastructure data reveals that many regions have limited electricity and internet access, especially in rural areas, making it difficult to implement digital healthcare solutions. Regions like Eastern Rwanda and Central Senegal have the highest percentage of healthcare facilities with no access to electricity or internet **(63% and 57%** respectively). Expanding mobile clinics and integrating telemedicine services in areas with electricity and internet access can improve healthcare delivery in remote locations. Governments should invest in solar-powered healthcare units to ensure rural areas benefit from digital healthcare solutions.

c) Incentives for Healthcare Workers

Rural areas often struggle with staffing shortages, as seen in the dataset where some rural facilities have significantly fewer doctors and nurses compared to urban ones. Offering financial incentives, housing support, and career development opportunities for healthcare professionals working in underserved areas can help retain skilled workers. Policies should include loan forgiveness programs, higher salaries, and training programs specifically targeting rural healthcare workers.

d) Subsidized Healthcare Programs for Low-Income Groups

The funding level classification shows that some healthcare facilities operate with low funding levels **(< $45,000)**, which can impact service quality. Affordable or free healthcare programs should be introduced, especially for low-income groups in rural areas, to ensure equitable access to medical care. Governments should prioritize funding allocations for essential services, such as maternal healthcare, emergency response, and preventive care, to reduce health disparities.

7. How Can Governments Optimize Healthcare Funding Allocation to Maximize Impact in Underserved Regions?

Chart Type: Line Chart

X-Axis: Regions

Y-Axis: Funds Received (USD)

Analysis

This line chart displays the distribution of healthcare funding across various regions, highlighting disparities in resource allocation.

Regions with the Highest Funding:

- Southern Zambia and Dar es Salaam receive the highest funding, exceeding $23M.

- Central Senegal and Northern Ghana also receive relatively high allocations, suggesting a focus on these regions for healthcare investment.

Regions with the Lowest Funding:

- Eastern Ethiopia receives the least funding, falling below $20M, indicating a significant funding gap.
- Western Kenya and Central Malawi also have lower funding levels, suggesting the need for increased investment in these areas.

Funding Distribution Trends:

A gradual decline in funding is observed from Southern Zambia to Eastern Ethiopia, reflecting an imbalance in fund allocation.

Regions receiving lower funds may struggle with healthcare infrastructure development, workforce retention, and access to essential medical services.

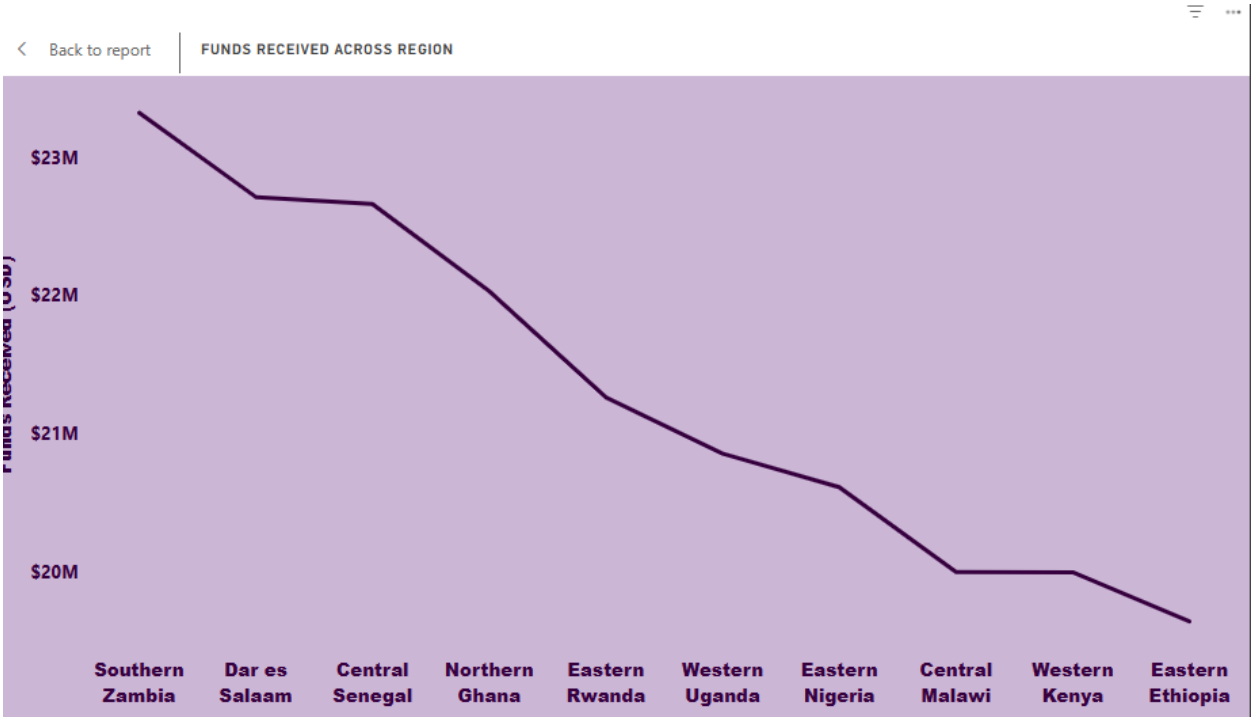
Implications for Healthcare Policy:

Priority funding should be directed towards low-funded regions (Eastern Ethiopia, Western Kenya, Central Malawi) to ensure equitable healthcare access.

Efforts should be made to investigate why certain regions receive significantly more funding than others—factors like population density, disease burden, and existing healthcare infrastructure should guide future allocations.

Public-private partnerships and alternative funding sources can help bridge the financial gap in underserved regions.

By optimizing fund distribution and ensuring equitable resource allocation, governments can enhance healthcare service delivery and improve health outcomes in underfunded areas



Expected Outcomes

1. **Identify Key Disparities in Healthcare Access Between Rural and Urban Regions.**

Disparities in Healthcare Access Between Rural and Urban Regions

a) **Facility Distribution**: **Urban** areas have a higher concentration of healthcare facilities compared to **rural** areas, with clinics (389 vs. 307), health centers (353 vs. 326), and hospitals (327 vs. 298). This suggests that urban populations have greater access to medical services, while rural communities may have to travel further to reach healthcare providers.

b) **Funding Gap:** Urban regions receive **53.3%** of total healthcare funding, while rural areas receive **46.7%.** While the difference may seem small, urban areas typically have larger populations, meaning the per-capita funding in rural areas is actually higher. However, this does not necessarily translate into better services, as rural areas face greater infrastructure challenges that require additional investment.

c) **Response Time Differences: Clinics** (low funding) respond faster than hospitals, suggesting efficiency in smaller facilities. **Hospitals** (higher funding) have longer response times, possibly due to operational inefficiencies, logistical delays, or higher patient loads. **Health centers** fall in between, receiving moderate funding but still struggling with response times. Improving emergency response infrastructure—such as ambulance availability and digital coordination—could reduce delays and save lives.

2. Analyze The Efficiency of Healthcare Funding and Resource Allocation Across Different Facilities.

Efficiency of Healthcare Funding and Resource Allocation

a) **Cost-Efficiency of Facility Types**: **Clinics** are the most cost-efficient: They receive the least funding but deliver faster response times and cater to a large number of patients.
Hospitals receive the highest funding per facility, yet response times are longer, suggesting inefficiencies in staffing, logistics, or emergency preparedness.
Health centers receive moderate funding, but their response times are closer to hospitals than clinics, indicating room for operational improvements.

b) Funding and Response Times: More funding does not always translate to better efficiency. **Clinics** operate on lower budgets but respond quickly, while **hospitals** receive higher funding but experience slower response times.
Investments should focus on optimizing emergency response, rather than just increasing funding.

3. Provide Data-Driven Insights to Improve Emergency Response Times and Patient Satisfaction.

Data-Driven Insights to Improve Emergency Response and Patient Satisfaction

a) Funding Alone Is Not Enough

Despite higher funding, hospitals still struggle with response times, indicating logistical and operational issues. Instead of just increasing budgets, targeted investments in transportation, digital coordination, and staffing are needed.

b) Emergency Response Investments:

Ambulance networks and transportation logistics should be strengthened to ensure faster patient transfers. Digital systems (such as telemedicine and real-time patient tracking) could enhance efficiency and reduce delays.

c) Workforce Shortages and Patient Satisfaction:

The **77.48%** patient satisfaction rate suggests that workforce shortages, wait times, and service quality could be improved. Addressing doctor-patient ratios and training rural healthcare workers could enhance service delivery.

3. Develop Strategic Recommendations for Policymakers to Ensure Equitable Healthcare Access.

Strategic Recommendations for Policymakers

a) **Reallocate More Funding to Rural Areas**:

While rural funding is close to urban levels, it should be increased further to address infrastructure challenges and workforce shortages. Targeted funding for rural clinics and emergency services could improve healthcare accessibility.

b) Expand Clinics in Rural Areas:

Clinics are cost-effective and provide fast responses, making them an ideal scalable solution for rural healthcare gaps. Investing in more clinics could bring healthcare closer to rural populations.

c) Optimize Hospital Operations:

Since higher funding does not automatically improve efficiency, hospitals should focus on:

- Process improvements to streamline operations.
- Better staffing strategies to reduce wait times.
- Emergency preparedness measures to cut down response times.

d) Incentivize Healthcare Workers in Rural Regions:

Many doctors and nurses prefer urban areas due to better salaries, infrastructure, and career growth. Offering financial incentives, housing benefits, and professional development opportunities could attract more healthcare professionals to underserved regions.

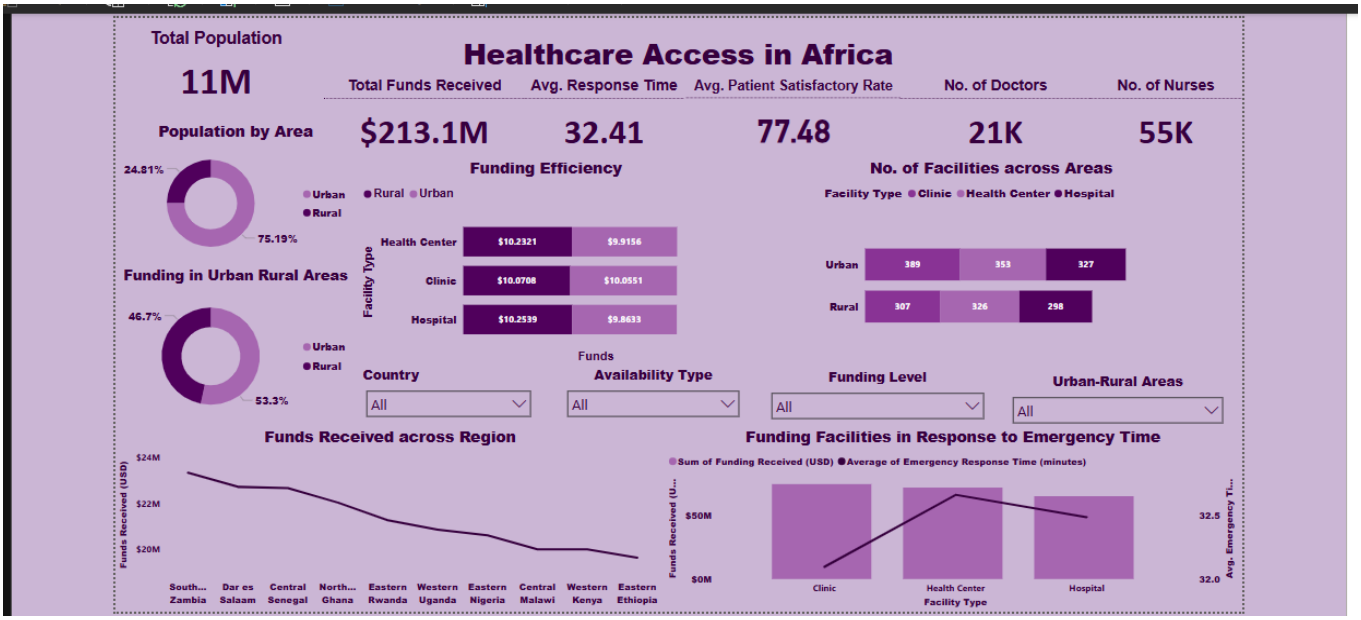
4. Use Data Visualization Techniques to Communicate Your Findings Effectively to Stakeholders.

Other visuals include: Key Metrics (Card Visuals)

- **Total Population**: The total population is 11 million. This provides context for the other metrics, showing the scale of healthcare access relative to the population.
- **Total Funds Received**: $213.1M → Significant investment has been made in healthcare infrastructure.
- **Avg. Response Time**: 32.41 minutes → This suggests the speed of healthcare services, with potential for improvement.
- **Avg. Patient Satisfaction Rate**: 77.48% → A relatively high satisfaction rate, indicating a positive patient experience.

- **Number of Doctors**: 21K → Shows healthcare workforce strength.
- **Number of Nurses**: 55K → More nurses than doctors, which aligns with typical healthcare workforce structures.

HEALTHCARE ACCESS IN AFRICA DASHBOARD



CONCLUSION

The analysis of healthcare facility distribution and funding efficiency has highlighted significant disparities between rural and urban areas. The findings indicate that rural healthcare facilities receive less funding and face greater challenges in accessibility and emergency response times. Moreover, the efficiency of funding utilization varies across different facility types, revealing areas where improvements can be made. By leveraging Power BI, we have visualized key trends and identified actionable insights that can drive data-driven decision-making for policymakers and stakeholders.

Recommendations

1. **Optimized Funding Allocation:** Policymakers should implement data-driven funding models to ensure equitable distribution of resources, prioritizing underserved rural areas.
2. **Infrastructure Investment:** Increased investment in healthcare infrastructure, such as building more facilities and improving transportation networks, will enhance access to healthcare services.
3. **Enhanced Emergency Response Strategies:** A review of emergency response systems is necessary to reduce response times in underfunded areas. Implementing real-time monitoring and predictive analytics can improve efficiency.
4. **Capacity Building & Training:** Government agencies and healthcare providers should invest in training programs to improve service delivery, especially in remote regions.

By implementing these recommendations, healthcare disparities can be minimized, funding can be utilized more effectively, and overall healthcare accessibility can be improved for all communities.

LINK TO THE DASHBOARD

https://drive.google.com/file/d/1BJr6XrvaW4pl97cWfKs12YoTK1gNQYF5/view?usp=sharing