Exploratory Data Analysis on Trends in Growth rate, Fertility rate , Mortality Rate and Life Expectancy in Kenya

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Introduction

- Understanding population trends and anticipating demographic change are crucial for national development planning and for implementing the 2030 Agenda for Sustainable Development. The 2030 Agenda emphasizes that people are at the Centre of sustainable development, demographic trends are harbingers of future challenges to achieving the sustainability development goals.
- Kenya's population has continuously increased over the years and rapid population is set to continue . According to recent UN projections , the population is expected to grow by 1 million per year . Kenya's annual growth is 2.28% per year.
- Following a drop in infant mortality rate , population growth of Kenya has increased over the years.

Population Distribution of Kenya From 2017-2021

The figure below shows trends in growth rate ,life expectancy , birth rate ,death rate and infant fertility rate in Kenya

Country	Year	Total Population	Life Expectancy	Birth Rate	Death Rate	Fertility Rate	Infant Mortality Rate	Growth Rate
Kenya	2017	-	62.0	29.755	7.294	3.643	31.6	-
Kenya	2018	49,953,304	63.0	29.180	7.305	3.58	30.6	2.0
Kenya	2019	50,951,450	63.0	28.460	7.290	3.469	29.7	2.0
Kenya	2020	51,985,780	63.0	27.998	7.456	3.397	29.0	2.0
Kenya	2021	53,005,614	61.0	27.685	8.056	3.335	28.0	2.0

Problem Statement

Exploring key demographic characteristics like life expectancy, birth rate, death rate, and fertility rate over the years can yield valuable insights into a country's population dynamics.

Understanding the underlying factors contributing to these demographic changes is crucial for informed policy planning and resource allocation.

Research Question

What is the status of the demographic Characteristics in Kenya over the years and its indication ?

Hypothesis

- Null Hypothesis(H0):There is no association between the demographic factors (Total Population, Life Expectancy, Birth Rate, Death Rate) and the demographic indicator (Fertility Rate) in the given dataset.
- Alternative Hypothesis(H1):At least one of the demographic factors (Fertility rate, Infant Fertility rate, Life Expectancy, Birth Rate, Death Rate) is associated with the demographic indicator (Growth Rate) in the given dataset.

Descriptive Statistics

- The data set consisted of 1073 rows and 12 columns
- No nulls or duplicated data observed

Sample data

	Country	Year	Total Population	Urban Population	Rural Population	Population Density	Life Expectancy	Birth Rate	Death Rate	Fertility Rate	Infant Mortality Rate	Growth Rate
0	Afghanistan	2017	-	-	-	55	63.0	37.342	7.027	5.129	49.4	-
1	Afghanistan	2018	36,686,784	9,353,296	27,333,488	56	63.0	36.927	6.981	5.002	47.8	3.0
2	Afghanistan	2019	37,769,499	9,727,157	28,042,342	58	64.0	36.466	6.791	4.87	46.3	3.0
3	Afghanistan	2020	38,972,230	10,142,913	28,829,317	60	63.0	36.051	7.113	4.75	44.8	3.0
4	Afghanistan	2021	40,099,462	10,551,772	29,547,690	-	62.0	35.842	7.344	4.643	43.4	3.0

Feature Description

Objective Features
- Year
- Country

Subjective Features
- Growth Rate: Increasing or decreasing over the years

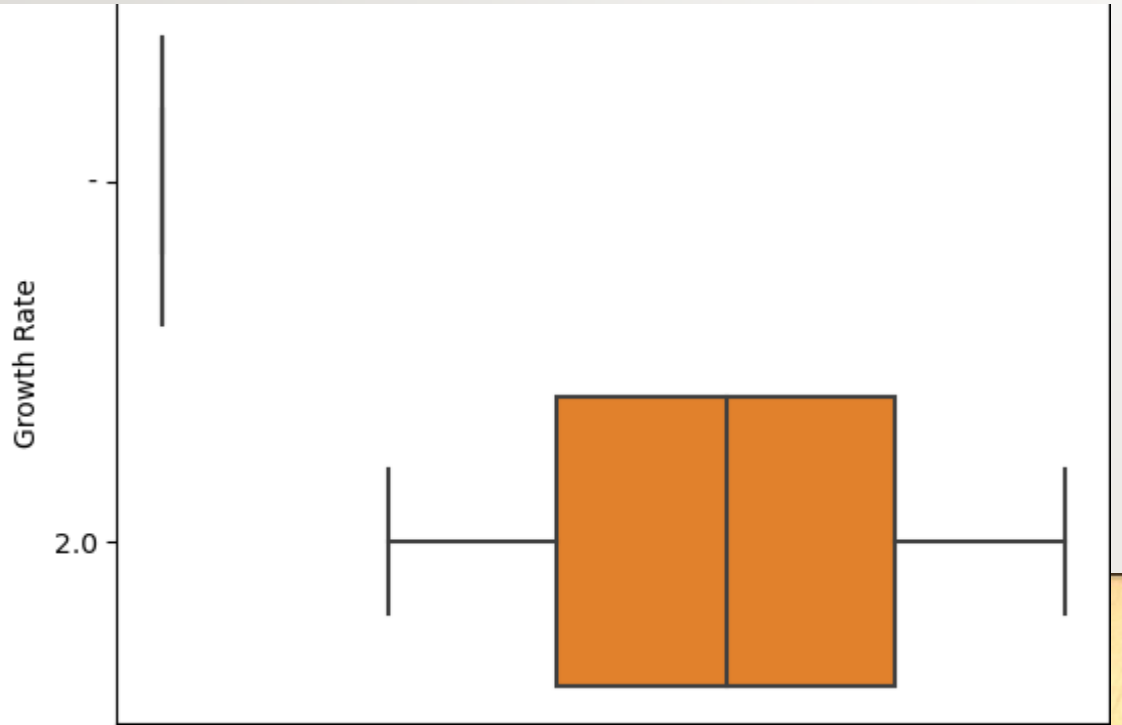
Examination Feature
- Life expectancy
- Fertility Rate
- Birth rate
- Death rate
- Infant mortality rate

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1073 entries, 0 to 1072
Data columns (total 12 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Country               1073 non-null   object
 1   Year                  1073 non-null   int64
 2   Total Population      1073 non-null   object
 3   Urban Population      1073 non-null   object
 4   Rural Population      1073 non-null   object
 5   Population Density    1073 non-null   object
 6   Life Expectancy       1073 non-null   object
 7   Birth Rate            1073 non-null   float64
 8   Death Rate            1073 non-null   float64
 9   Fertility Rate        1073 non-null   object
 10  Infant Mortality Rate 1073 non-null   object
 11  Growth Rate           1073 non-null   object
dtypes: float64(2), int64(1), object(9)
memory usage: 100.7+ KB
```

Measures of Central Tendencies

	Year	Birth Rate	Death Rate
count	1073.000000	1073.000000	1073.000000
mean	2019.013048	18.801519	7.841907
std	1.410190	9.903449	2.973418
min	2017.000000	0.000000	0.000000
25%	2018.000000	10.620000	6.067000
50%	2019.000000	16.025000	7.396000
75%	2020.000000	25.921000	9.313000
max	2021.000000	46.351000	21.700000

Growth Rate by year



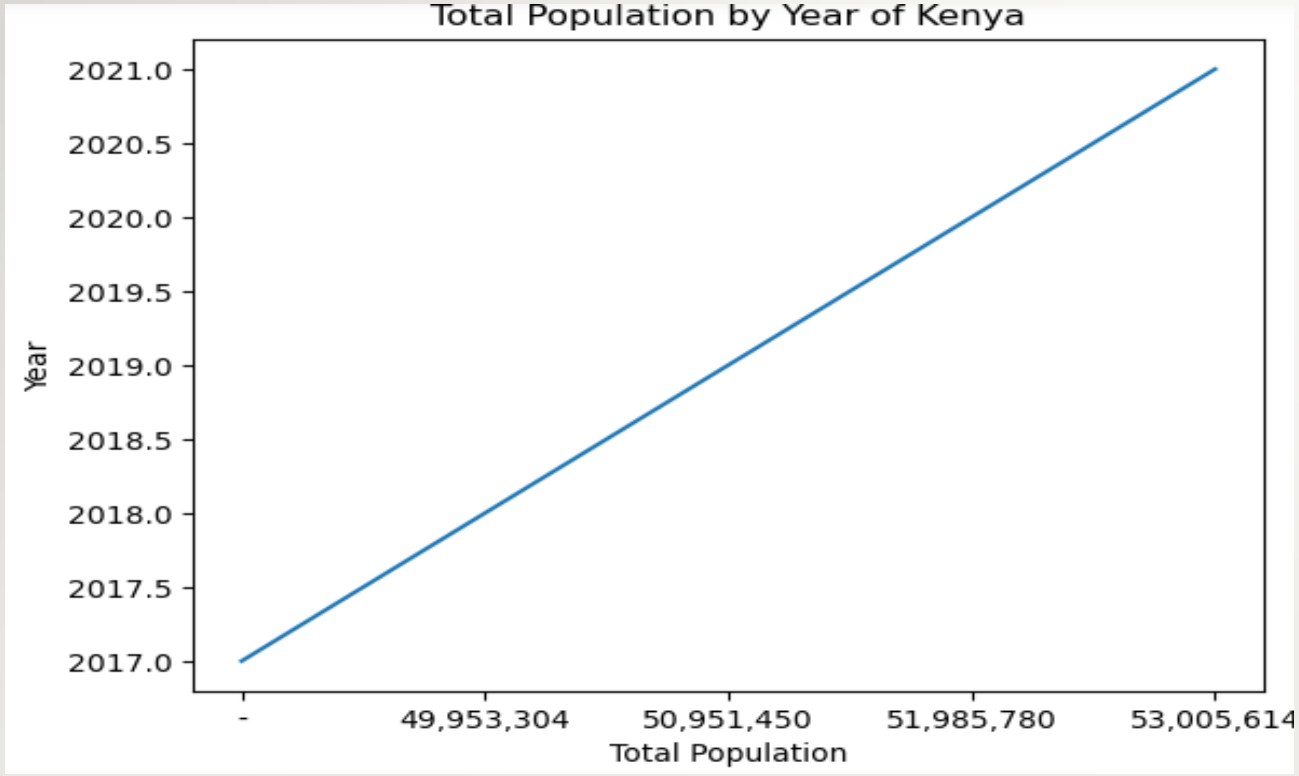
Data Cleaning

- Checked for nulls – there was no observed missing or null values.
- Checked for duplicate values. No observed were found.
- Created a new a data frame for analysis with selected columns and selected country for analysis.
- selected columns were Country, Year, Total Population, Life Expectancy ,Birth Rate, Death Rate, Fertility Rate, Infant Mortality Rate , and Growth Rate.

Data Exploration

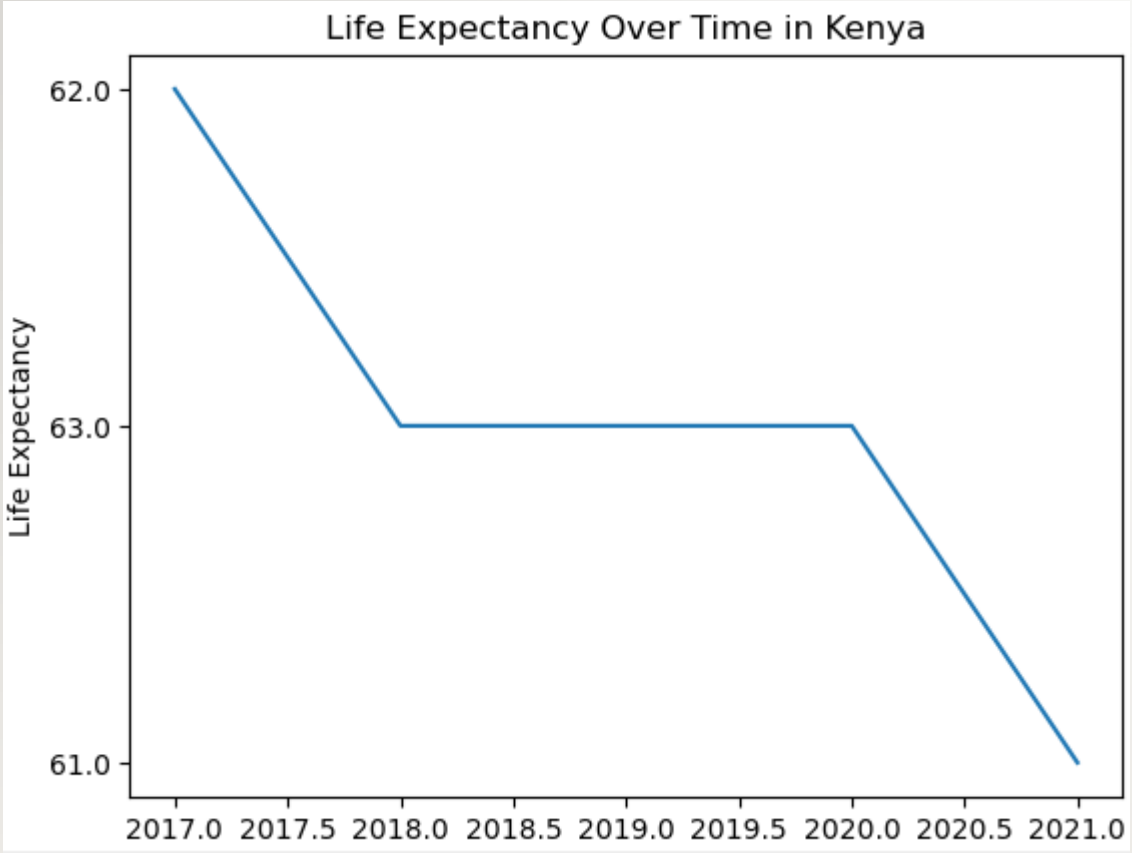
Data Exploration

Time Trends



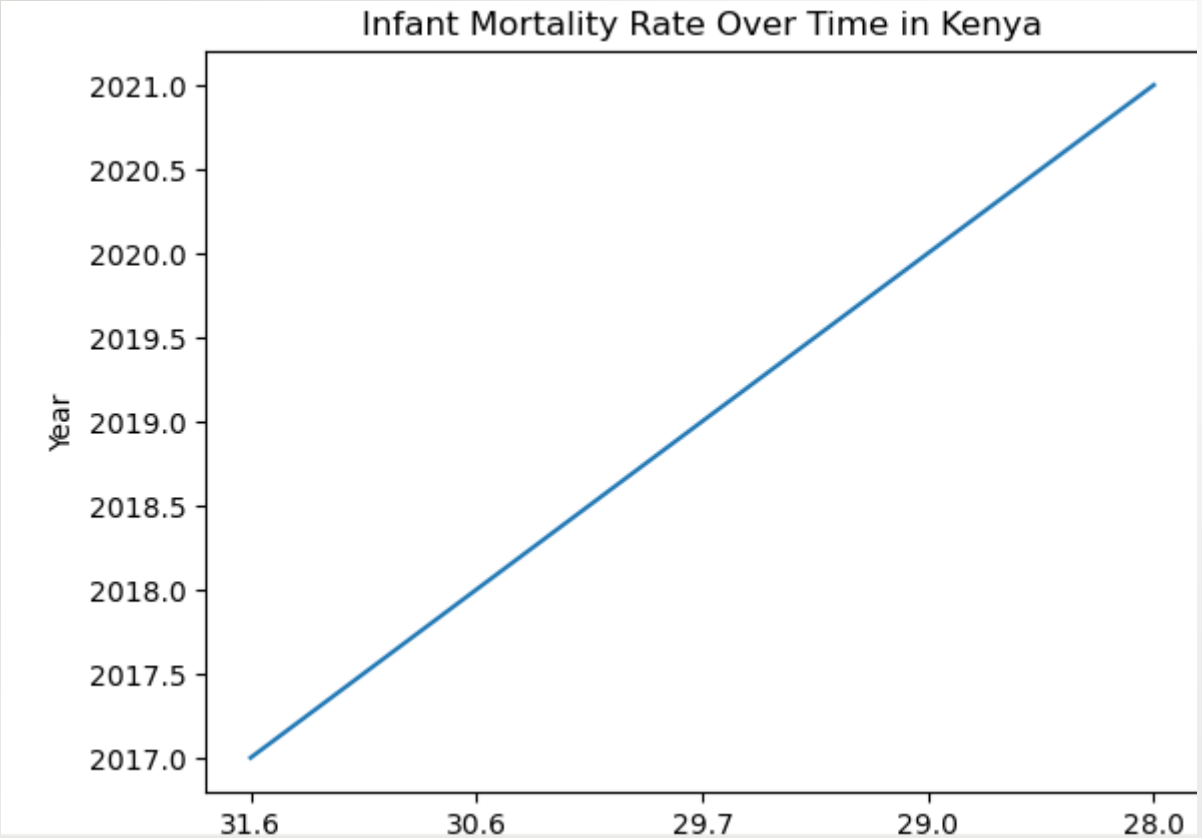
Data Exploration

Time Trends cont.



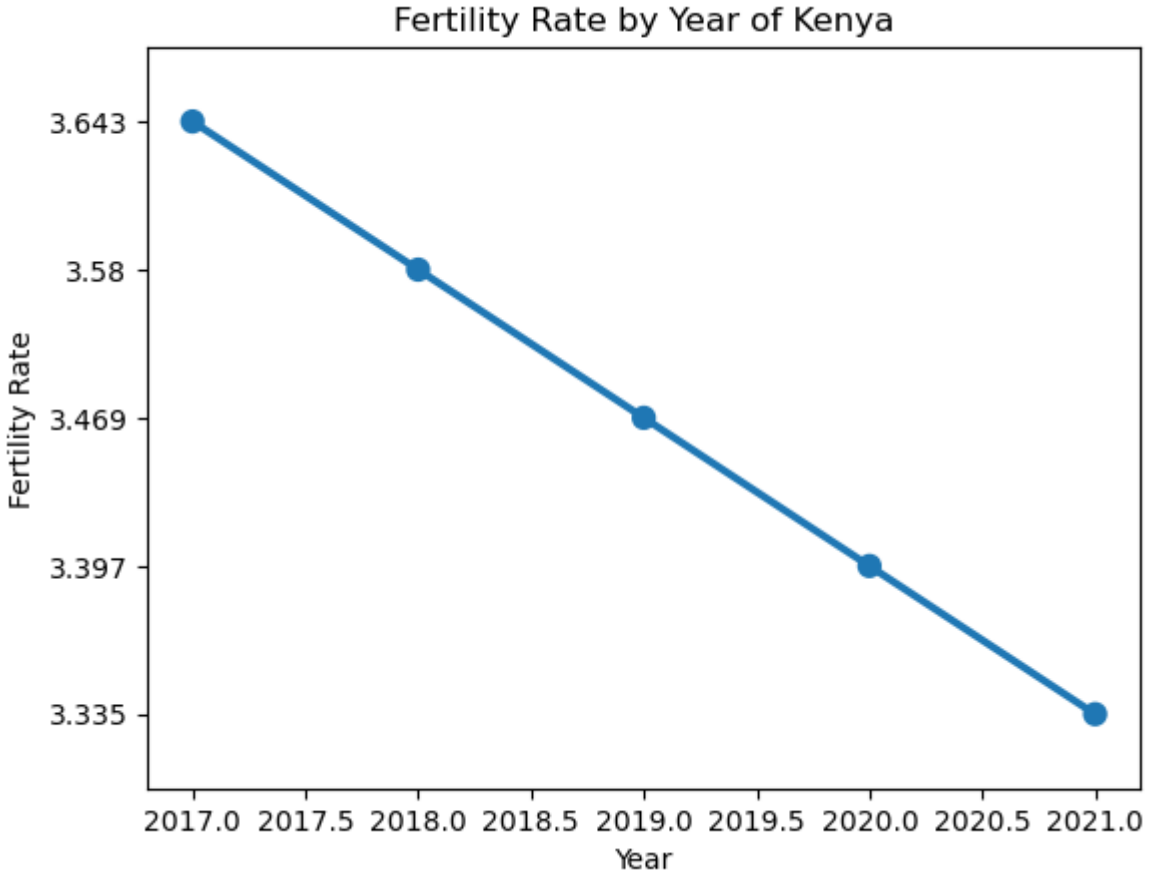
Data Exploration

Time Trends cont.



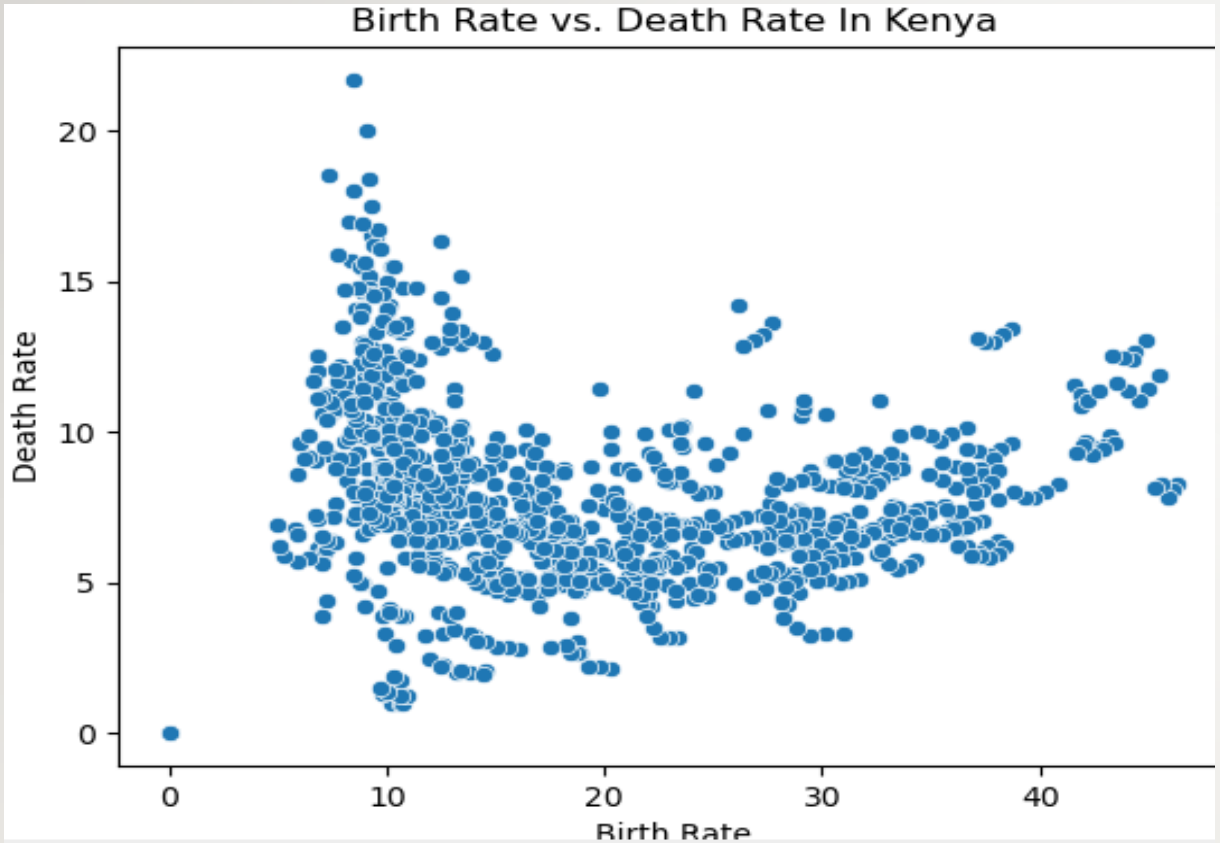
Data Exploration

Time Trends cont.



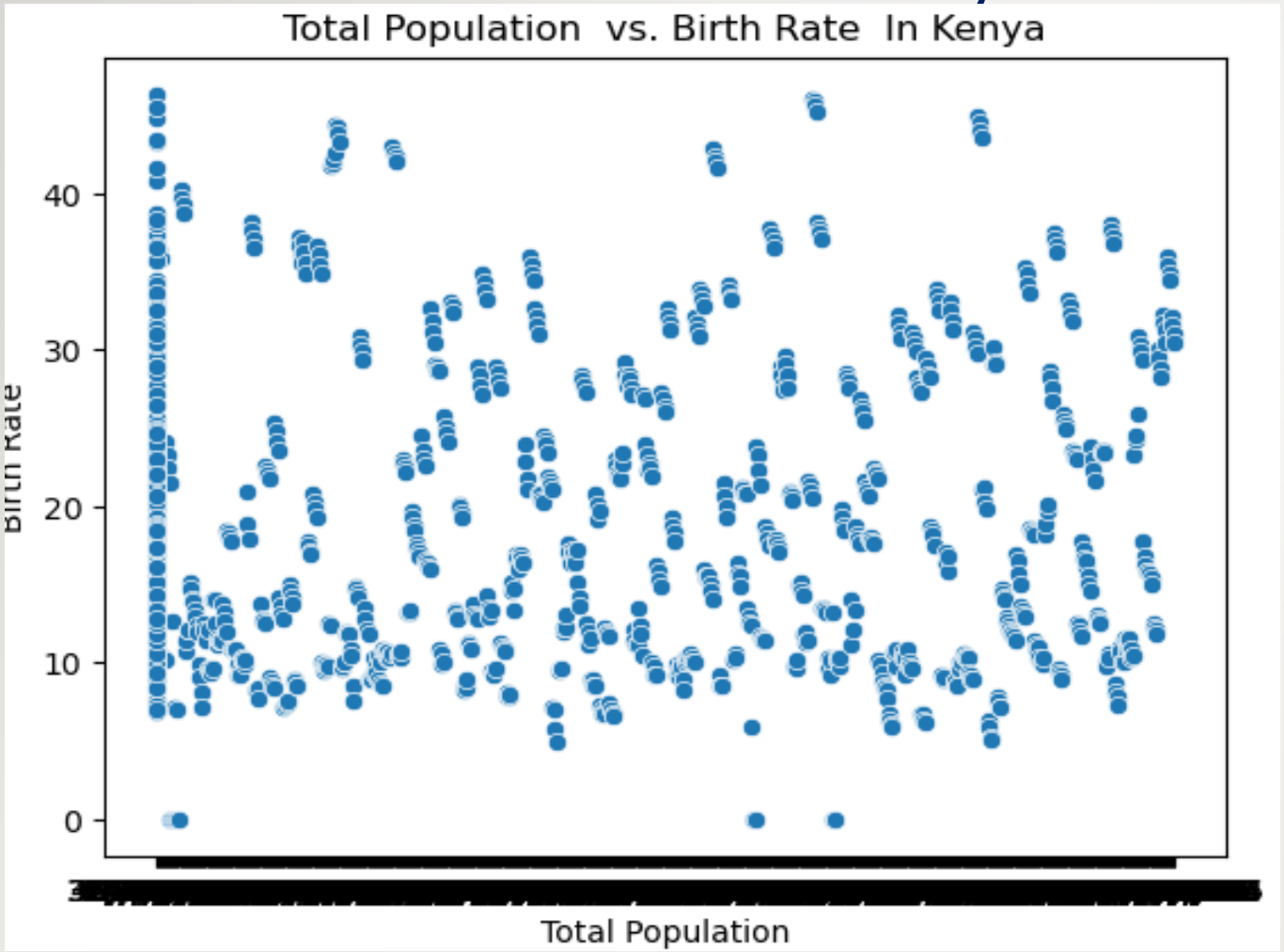
Fertility Rate has been dropping yearly by 0.1%rate

Correlation Analysis



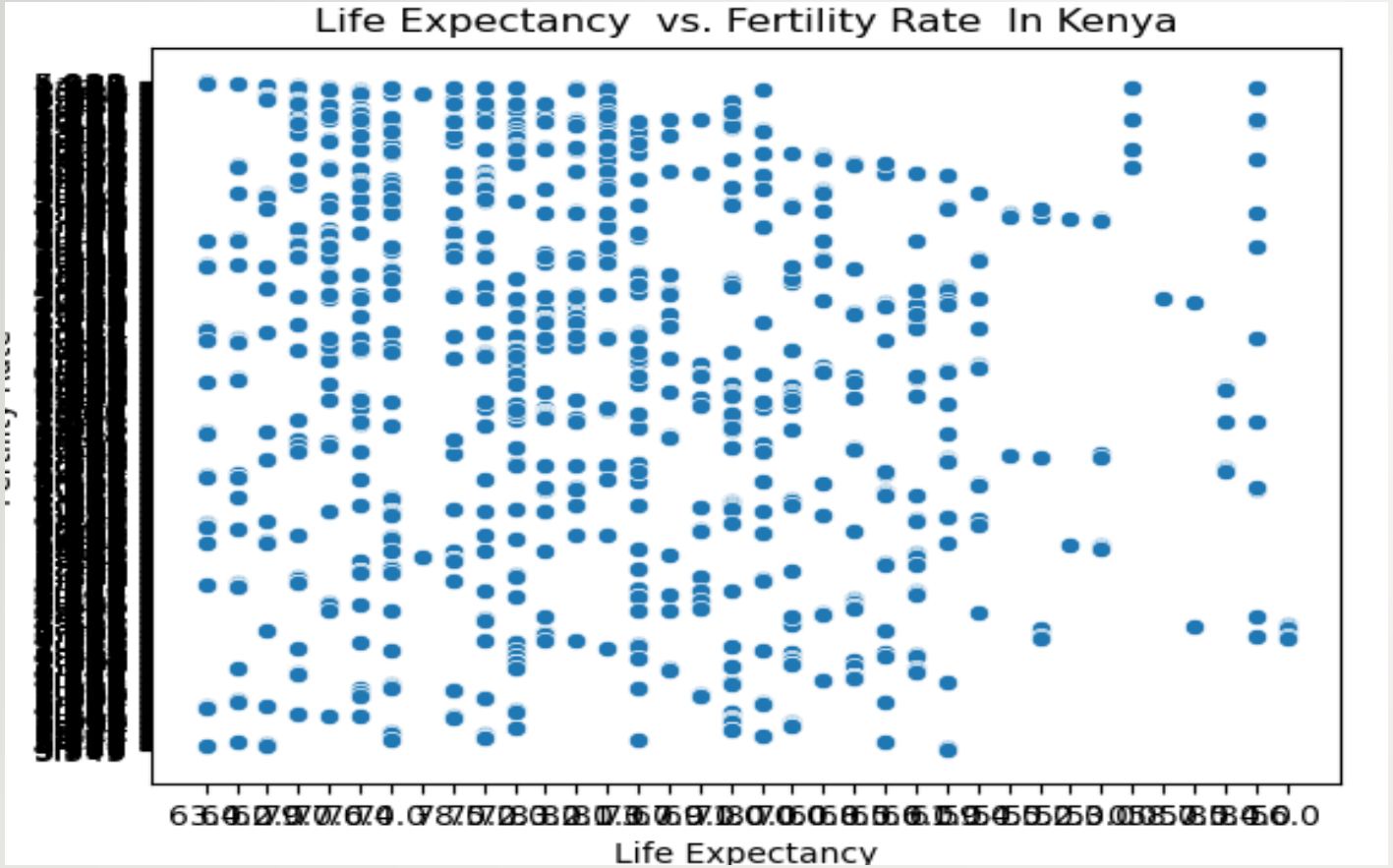
Birth rate increases as death rate increases hence there is a positive correlation between the variables

Correlation Analysis



There is a positive relation between Birthrate and total population as birth rate increases total population increases

Correlation Analysis



There is some positive linear relationship between Life Expectancy and Fertility rate

Findings

Life Expectancy Trends:
Life expectancy has steadily decreased indicating poor healthcare and living conditions.

Birth Rate Changes:
The birth rate has been declining, possibly due to increased access to family planning services and changes in societal norms.

Death Rate Trends:
The death rate has increased, raising concerns about health challenges

Fertility Rate Patterns:
The fertility rate has declined, indicating that women may be having fewer children, potentially due to increased educational and economic opportunities.

Infant Mortality Rate:
Infant mortality has decreased, indicating improvements in maternal and child healthcare.

Limitations

1) Data quality is generally reliable, but there are limitations in specific years

2) In order to answer the question better we would need additional information like age group and gender population .

References

Source of Dataset:
https://www.kaggle.com/

https://www.worldbank.org/en/news/opinion/2010/04/28/demographic-transition-growth-kenya

https://en.wikipedia.org/wiki/Demographics_of_Kenya

https://www.worldometers.info/world-population/kenya-population/

Any questions?