

A World in Transition: Glimpse into Growth

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1.1 Introduction

Global population dynamics are more than just numbers; they're the stories of societies, economies, and entire regions changing. It is critical for policymakers, researchers, and NGOs who rely on population data to make strategies and allocate resources to understand these changes. This informed the development of **"A World in Transition: Glimpse into Growth,"** an interactive dashboard that captures these patterns.

The datasets containing population dynamics were transformed into an interactive and flexible dashboard that explores population growth, urbanization rates, and health metrics across regions and income groups. The dashboard spans historical data and projections from 1960 through 2050.

1.1.1 Dashboard's Purpose

This dashboard will tackle this main question: How do population growth, urbanization, and health vary across regions and income levels, and what do these patterns mean?

- **Population Growth Patterns:** Some regions and income groups experience rapid growth, while others stabilize or even decline, why?
- **Urbanization Growth:** This dashboard aims to uncover urbanization trends over the years and how regions and income groups affect it.
- **Health Metrics:** The quality of life across various regions and income groups can be understood by examining birth rates, death rates, and life expectancy.
- **Making Data-Driven Decisions:** Finally, the dashboard also explores future predictions, which can help users make more informed and impactful decisions.

The following sections explore how this dashboard was created, from data preparation to design and discover the choices that shaped the dashboard.

1.1.2 Data Overview

Two datasets were used in creating this dashboard Population figures and projections which contained 19,748 with 12 columns and Country groupings which had 218 observations with 4 columns.

1.1.2.1 Population Figures and Projections Dataset

Table Error! No text of specified style in document..1 Description of the population figures and projections dataset

COLUMN	DESCRIPTION
COUNTRY NAME	Name of country
COUNTRY CODE	Country code
TIME	Year
TIME CODE	Year code
FEMALE POPULATION	Total female population
MALE POPULATION	Total male population
ANNUAL POP GROWTH(%)	Annual population growth rate
RURAL POPULATION	Population of people living in rural areas
URBAN POPULATION	Population of people living in urban areas
LIFE EXPECTANCY	Number of years of life
BIRTH RATE	Number of life births during the year per 1000 people
DEATH RATE	Number of life deaths during the year per 1000 people

1.1.2.2 Country Groupings Dataset

Table *Error! No text of specified style in document..2* Description of the Country Grouping Dataset

COLUMN	DESCRIPTION
CODE	Country code
ECONOMY	Country name, with 218 countries
REGION	Region of the world; containing 7 regions
INCOME GROUP	Groupings based on gross national income (GNI) per capital

1.2 Data Preparation

Creating a dashboard that can convey the story requires laying a strong foundation. This will be achieved through Data preparation and Modelling.

1.2.1 Data Importation

The first step was importing two datasets from Excel; Population figures and projections and Country groupings, which included several key columns containing data spanning from 1960 to 2050.

1.2.2 Data Cleaning and Transformation

After importing the data, the cleaning and transformation phase began using PowerQuery, where the data was cleaned and transformed for analysis with these steps:

- **Formatting data types:** PowerQuery handles datatypes by default, but each column was carefully evaluated and formatted accordingly.
- **Handling Missing Values:** Blank rows were first removed, then missing values were evaluated, as the data is real-world data, no imputations were done to avoid bias.
- **Renaming Tables & Columns:** Tables and columns were renamed to easily interpretable titles (e.g. "Population figures & projections" to "Population data" and "Population, female [SP.POP.TOTL.FE.IN]" to "Female Population").
- **Dropping Duplicates:** Duplicated rows were dropped to avoid redundancies and aid relationship building.

1.2.3 Relationships and Modelling

With cleaned and structured data, the next phase was to establish relationships between the two tables, to enable interactive exploration.

- **Setting Up Relationships:** A many-to-one relationship was built between the two datasets, linking the country code in the country grouping table with the country code in the population figures & Projections. This ensured smooth, responsive filtering across different categories.

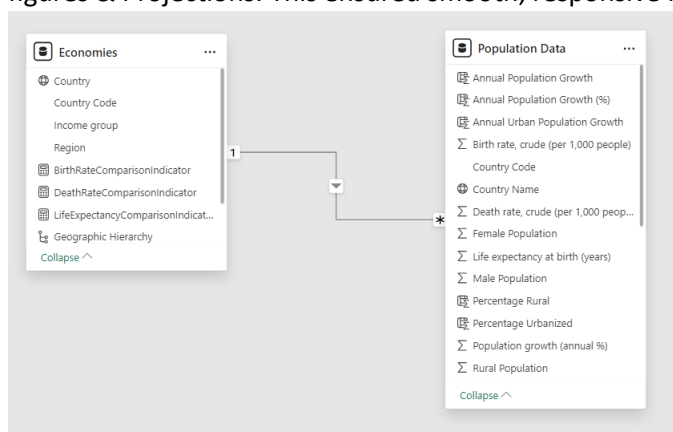


Figure *Error! No text of specified style in document..1* Setting up the relationship between the two datasets

- **Hierarchies:** A Hierarchy was created with the region and countries to enable flexible slicing and drill-downs for deeper explorations.



Figure Error! No text of specified style in document..2 Geographical Hierarchy

- **Creating DAX Codes:** Calculated columns and measures were created to extract meaningful insights using DAX (Data Analysis Expressions) codes.

1.2.3.1 Calculated Columns

Annual Population Growth (%): Calculates the percentage year-over-year growth rate of the population.

```
Annual Population Growth (%) =
VAR CurrentYearPopulation = 'Population Data'[Total Population]
VAR PreviousYearPopulation =
    CALCULATE(
        SUM('Population Data'[Female Population]) + SUM('Population Data'[Male Population]),
        FILTER(
            'Population Data',
            'Population Data'[Year] = EARLIER('Population Data'[Year]) - 1 &&
            'Population Data'[Country Name] = EARLIER('Population Data'[Country Name])
        )
    )
RETURN
IF(
    NOT(ISBLANK(CurrentYearPopulation)) && NOT(ISBLANK(PreviousYearPopulation)),
    DIVIDE(
        CurrentYearPopulation - PreviousYearPopulation,
        PreviousYearPopulation
    ),
    BLANK()
)
```

Figure Error! No text of specified style in document..3 DAX code for calculating annual population growth (%)

Annual Population Growth: Calculates the year-over-year growth of the population.

```
Annual Population Growth =
VAR CurrentYearPopulation = 'Population Data'[Total Population]
VAR PreviousYearPopulation =
    CALCULATE(
        SUM('Population Data'[Female Population]) + SUM('Population Data'[Male Population]),
        FILTER(
            'Population Data',
            'Population Data'[Year] = EARLIER('Population Data'[Year]) - 1 &&
            'Population Data'[Country Name] = EARLIER('Population Data'[Country Name])
        )
    )
RETURN
IF(
    NOT(ISBLANK(CurrentYearPopulation)) && NOT(ISBLANK(PreviousYearPopulation)),
    CurrentYearPopulation - PreviousYearPopulation,
    BLANK()
)
```

Figure Error! No text of specified style in document..4 DAX code for calculating annual population growth

Year Category: Categorizes each year as either Historical (1960-2022) or Projected (2023-2050).

```
Year Category =  
IF ( 'Population Data'[Year] <= 2022, "Historical", "Projected" )
```

Figure Error! No text of specified style in document..5 DAX code for separating year into categories

Total Population: Combined population of both male and female gender

```
Total Population =  
'Population Data'[Female Population] + 'Population Data'[Male Population]
```

Figure Error! No text of specified style in document..6 DAX code for calculating total population

Annual Urban Population Growth: Calculates the year-over-year growth of the urban population

```
Annual Urban Population Growth =  
VAR CurrentYearUrbanPopulation = 'Population Data'[Total Population] - 'Population Data'[Rural Population]  
VAR PreviousYearUrbanPopulation =  
    MAXX(  
        FILTER(  
            'Population Data',  
            'Population Data'[Year] = EARLIER('Population Data'[Year]) - 1 &&  
            'Population Data'[Country Name] = EARLIER('Population Data'[Country Name])  
        ),  
        'Population Data'[Total Population] - 'Population Data'[Rural Population]  
    )  
RETURN  
IF(  
    NOT(ISBLANK(CurrentYearUrbanPopulation)) && NOT(ISBLANK(PreviousYearUrbanPopulation)),  
    CurrentYearUrbanPopulation - PreviousYearUrbanPopulation,  
    BLANK()  
)
```

Figure Error! No text of specified style in document..7 DAX code for calculating annual urban population growth

Percentage Urbanized: Calculated the percentage of Urban population.

```
Percentage Urbanized =  
IF(  
    NOT(ISBLANK('Population Data'[Urban Population])) &&  
    NOT(ISBLANK('Population Data'[Rural Population])),  
    DIVIDE(  
        'Population Data'[Urban Population],  
        'Population Data'[Urban Population] + 'Population Data'[Rural Population]  
    ),  
    BLANK()  
)
```

Figure Error! No text of specified style in document..8 DAX code for calculating the percentage urbanized

Urbanization Growth Rate (%): Calculates the percentage year-over-year growth rate of the urban population, showing how quickly urbanization is occurring.

```

Urbanization Rate Growth(%) =
VAR CurrentYearPercentUrbanized = 'Population Data'[Percentage Urbanized]
VAR PreviousYearPercentUrbanized =
    MAXX(
        FILTER(
            'Population Data',
            'Population Data'[Year] = EARLIER('Population Data'[Year]) - 1 &&
            'Population Data'[Country Name] = EARLIER('Population Data'[Country Name])
        ),
        'Population Data'[Percentage Urbanized]
    )
RETURN
IF(
    NOT(ISBLANK(CurrentYearPercentUrbanized)) && NOT(ISBLANK(PreviousYearPercentUrbanized)),
    CurrentYearPercentUrbanized - PreviousYearPercentUrbanized,
    BLANK()
)

```

Figure Error! No text of specified style in document..9 DAX code for calculating Urbanization rate growth

1.2.3.2 Calculated Measures.

Global Average Measures: These measures were used to calculate the global averages of specific metrics (e.g. birth rate, death rate etc.). It was created to be used as a comparison with the filtered metric. The DAX function removes the applied filters except for the year filter and then calculates the average of the selected metric.

```

GlobalAvgAnnualPopulationGrowth =
CALCULATE(
    AVERAGE('Population Data'[Annual Population Growth]),
    REMOVEFILTERS('Economies')
)

```

Figure Error! No text of specified style in document..10 DAX code for calculating Global average measures

The following global average measures were created:

- GlobalAverageAnnualPopulationGrowth
- GlobalAverageAnnualPopulationGrowth (%)
- GlobalAverageBirthRate
- GlobalAverageDeathRate
- GlobalAverageLifeExpectancy

Comparison Indicator Measures: These indicator measures compare how specific metrics (e.g., annual growth rates or urbanization rates) compare to global averages. It returns values indicating whether the region's metric is higher (1), equal (0), or lower (-1) than the global average.

```

BirthRateComparisonIndicator =
IF(
    AVERAGE('Population Data'[Birth rate, crude (per 1,000 people)]) > [GlobalAvgBirthrate],
    1,
    IF(
        AVERAGE('Population Data'[Birth rate, crude (per 1,000 people)]) < [GlobalAvgBirthrate],
        -1,
        0 // Returns 0 if the sliced average is equal to the global average
    )
)

```

Figure Error! No text of specified style in document..11 DAX code for growth rate comparison indicator

The following comparison indicators were created:

- GrowthRateComparisonIndicator
- GrowthRateComparisonIndicator (%)
- BirthRateComparisonIndicator
- DeathRateComparisonIndicator
- LifeExpectancyComparisonIndicator

Dynamic Title Measure: Creates a title based on the selected slicers.

```
DynamicTitle =
"A World in Transition: Glimpse into Growth ( "
& // Year handling: single year or range
IF (
    HASONEVALUE ( 'Population Data'[Year] ),
    SELECTEDVALUE ( 'Population Data'[Year] ),
    MIN ( 'Population Data'[Year] ) & " - "
    & MAX ( 'Population Data'[Year] )
)
& // Region handling: single region selected or omitted if all regions
IF (
    ISFILTERED ( 'Economies'[Region] ) && HASONEVALUE ( 'Economies'[Region] ),
    " | " & SELECTEDVALUE ( 'Economies'[Region] ),
    ""
)
& // Economy handling: single economy selected or omitted if all economies
IF (
    ISFILTERED ( 'Economies'[Country] ) && HASONEVALUE ( 'Economies'[Country] ),
    " | " & SELECTEDVALUE ( 'Economies'[Country] ),
    ""
)
& // Income Group handling: single income group selected or omitted if all income groups
IF (
    ISFILTERED ( 'Economies'[Income group] )
    && HASONEVALUE ( 'Economies'[Income group] ),
    " | " & SELECTEDVALUE ( 'Economies'[Income group] ),
    " )"
)
```

Figure *Error! No text of specified style in document..12* DAX code for Dynamic title

1.3 Dashboard Design

This section details the steps and justification taken to create the interactive dashboard. Every element in the dashboard was selected and placed with careful consideration to dashboard design best practices and user experience. The positioning of each visualization was from top left to bottom right based on the order of importance (Knaflic, 2015). Each chart, card and slicer contributes to the story and guides through the data from high-level information to detailed trends

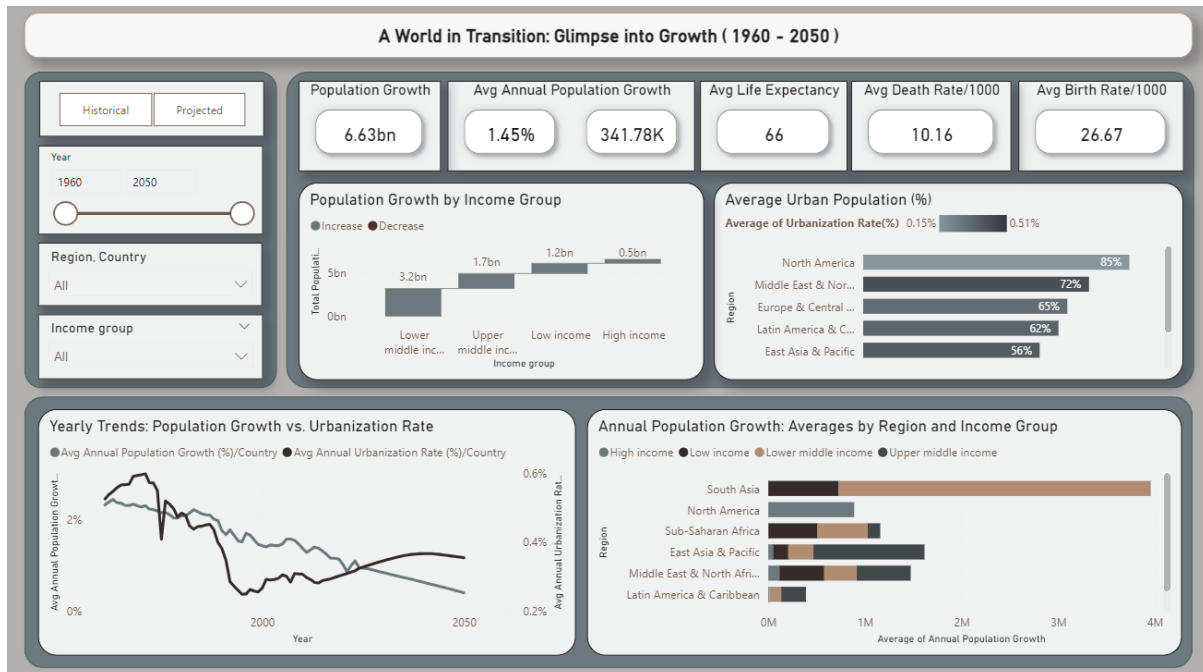


Figure Error! No text of specified style in document..13 A world in transition: glimpse into growth dashboard

1.3.1 Card - Dynamic Title

Unlike a normal title, the dynamic title changes based on the context from the slicers, which helps the users understand the data more easily based on the current filter settings. It was placed at the top centre to easily introduce the story and context of the dashboard.

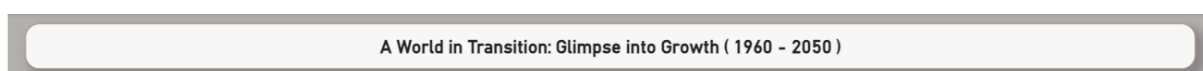


Figure Error! No text of specified style in document..14 Dynamic title with no selected slicers

Build Process: The title was built using a card with the DynamicTitle measure as the input. This makes sure the title conveys the selected slicers.

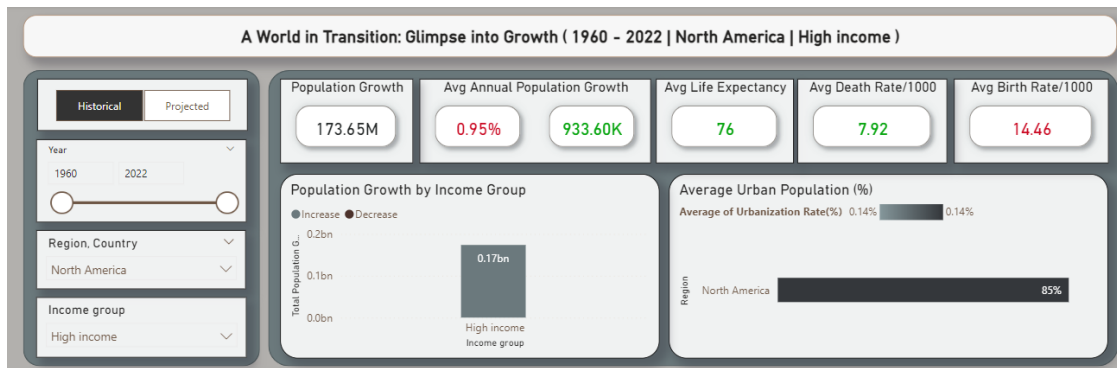


Figure Error! No text of specified style in document..15 Dynamic title filtered to only historical data for the North America region

1.3.2 Slicer Panel

The slicer panel is a collection of the year, year category, region, country, and income group slicers, which allows more interactive data exploration. Each slicer was configured with dropdowns or range sliders and the panel was placed top left, where it acts as a control centre for dashboard interactivity. Year category slicer was added to toggle easily between historical and projected data.

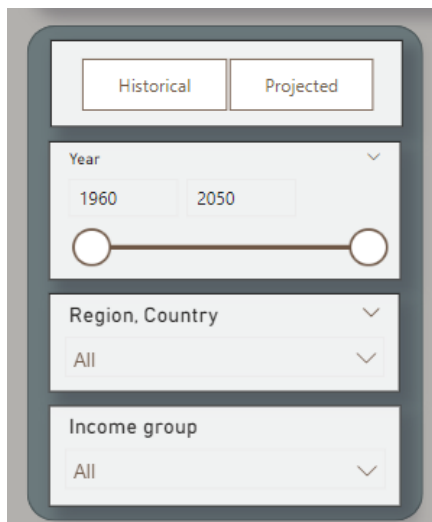


Figure Error! No text of specified style in document..16 Slicer panel showing the 4 slicers

1.3.3 KPI Cards: High-Level Summary Metrics

The KPI cards provide a quick high-level overview of the key metrics such as; Population Growth, Avg Annual Population Growth, Avg Life Expectancy, Avg Death Rate, and Avg Birth Rate. They were placed at the top to make it easy to see the essential figures at a glance, also acting as a summary to the dashboard, this positioning aligns with with Stephen Few's (2013) principle of "glanceability."

Each KPI card shows the average of key metrics based on the selected slicer, and the values were formatted with large text for easy readability.

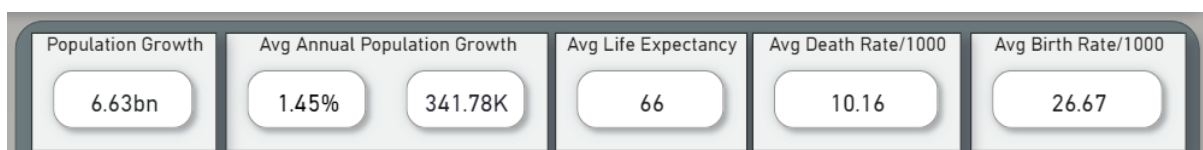


Figure Error! No text of specified style in document..17 KPI cards with no filters

Conditional formatting: Each card has been color-coded using the comparison indicator measures (green for above, red for below and black for equal) to compare the values with the global averages, to highlight regions or income groups performing above or below the global average. Some tooltips were added to convey additional information:

- Population growth card: Bar chart that shows total population growth in each region based on the selected filters
- Avg Annual Population Growth card: Cards showing the global average annual population growth for easy comparison.
- Avg Life Expectancy Card: Column chart displaying the average life expectancy for each income group and a card showing the global average life expectancy.
- Average Birth and Death Rate Cards: Line chart displaying trends in birth and death rates over the years and card showing global average birth and death rate.

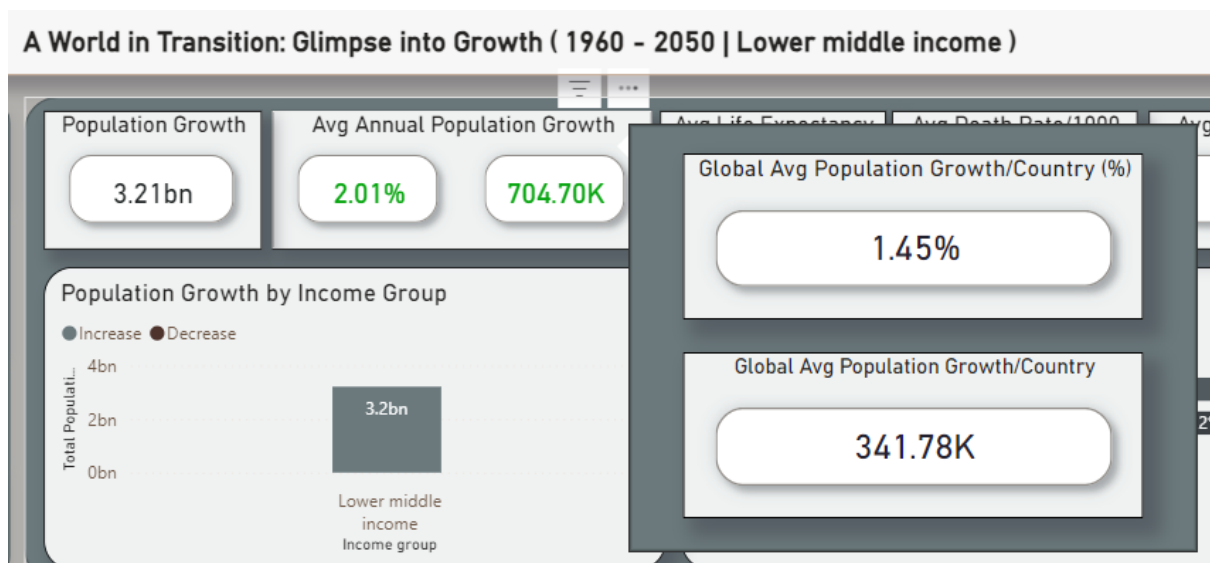


Figure **Error! No text of specified style in document..18** Avg annual population growth KPI card, filtered to lower middle-income group

Figure **Error! No text of specified style in document..18** shows countries in the lower middle-income group have a higher annual population growth than the global average, and has a total population growth of 3.21 billion people from 1960 – 2050.

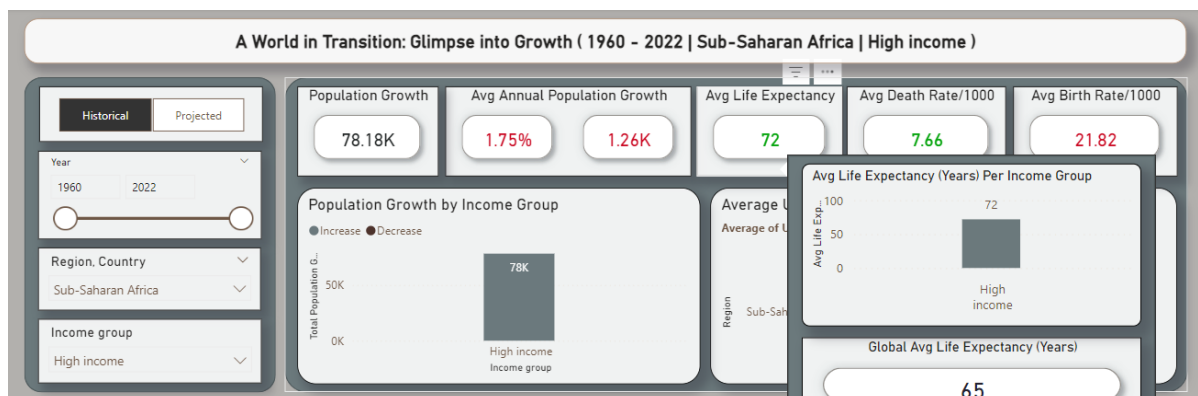


Figure **Error! No text of specified style in document..19** Dashboard filtered to high-income countries in Sub-Saharan Africa from years 1960-2022 (Historical data)

Figure Error! No text of specified style in document..19 shows the average annual population growth of the high-income countries in Sub-Saharan Africa from year 1960 – 2022 is less than the global average, but the Avg life expectancy (72 years) is higher than the global average which is 65 years. The Average death rate per thousand people is also lower than the global average (Indicated by the green colour), but the death birth rate is lower than the global average.

1.3.4 Waterfall Chart: Population Growth by Income Group

A waterfall chart was selected to show how each income group contributes to global population growth, displaying both increases and decreases in one visual, aligning with the Gestalt Principle of Continuity (Few, 2013).

The chart was built by assigning the income group to the X-axis and total population growth to the Y-axis. The bars are colour-coded, with green representing increase and dark brown for decrease, making it easy to identify contributions.

The number of countries and the average life expectancy for each income group were added as tooltips to provide additional information on each income group. The chart was placed just below the KPI cards, to transition from a high-level summary to a more detailed observation of how each income group contributes to population growth.

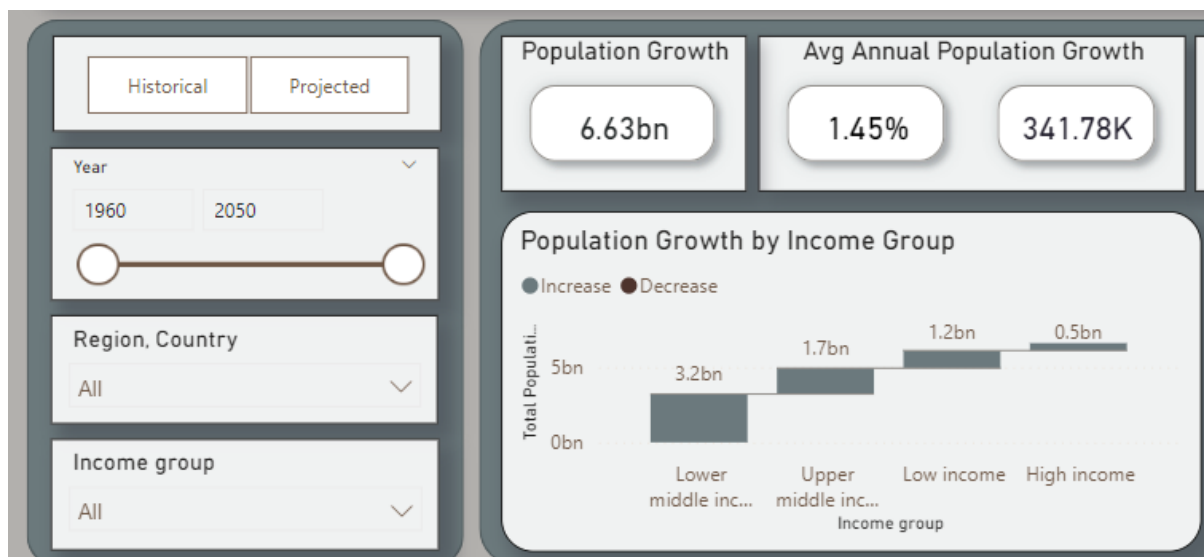


Figure Error! No text of specified style in document..20 Waterfall chart showing total population growth for all countries in each income group from 1960-2050

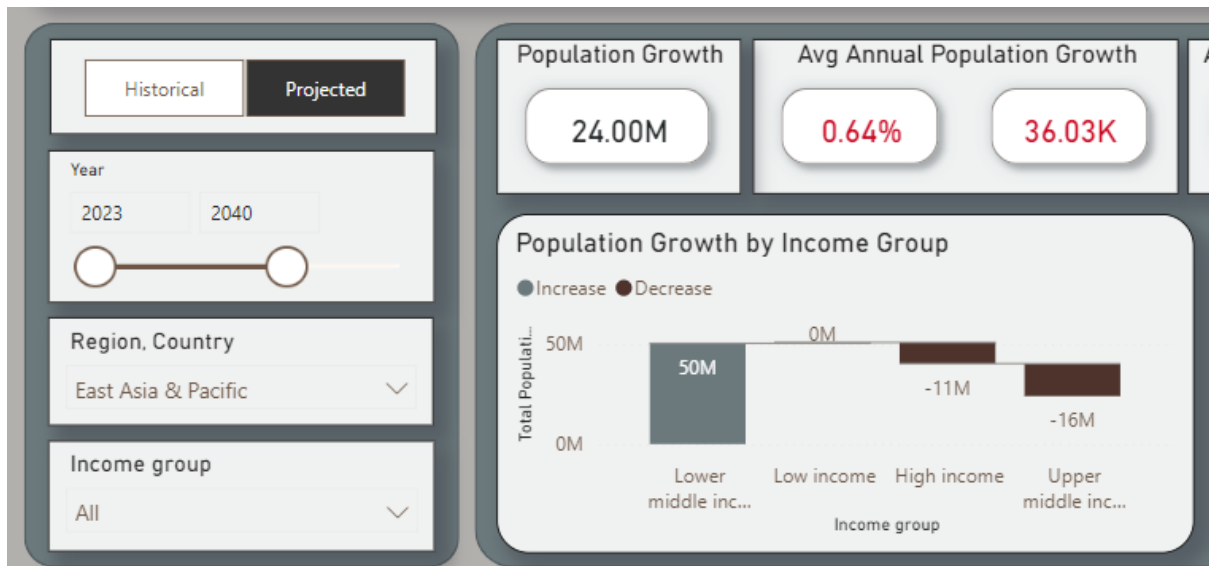


Figure **Error! No text of specified style in document..21** Waterfall chart showing total population growth for countries in East Asia & Pacific for all income groups from 2023-2040

From the chart in Figure **Error! No text of specified style in document..21**, there are no low-income countries in the East & Pacific, and only the countries in the lower middle-income group show a projected positive increase in population between the years 2023 and 2040.

1.3.5 Bar Chart: Average Urban Population % by Region

Bar charts are very effective when it comes to comparing categorical data (Schwabish, 2021), therefore a bar chart was selected to compare the average urban population across regions and countries.

The chart was built by placing the geographic hierarchy (region and country) on the Y-axis and the average percentage of urban population on the X-axis. By using the geographic hierarchy, country-level information can be accessed by drilling down the graph.

The bars were further formatted with urbanization rate by using darker shades to show a higher increase in urban population. Tooltips were used to display exact urban population percentages and the urbanization growth rate.

Located next to the waterfall chart, this bar chart provides a region-based view of urbanization trends, for easy geographical comparisons.

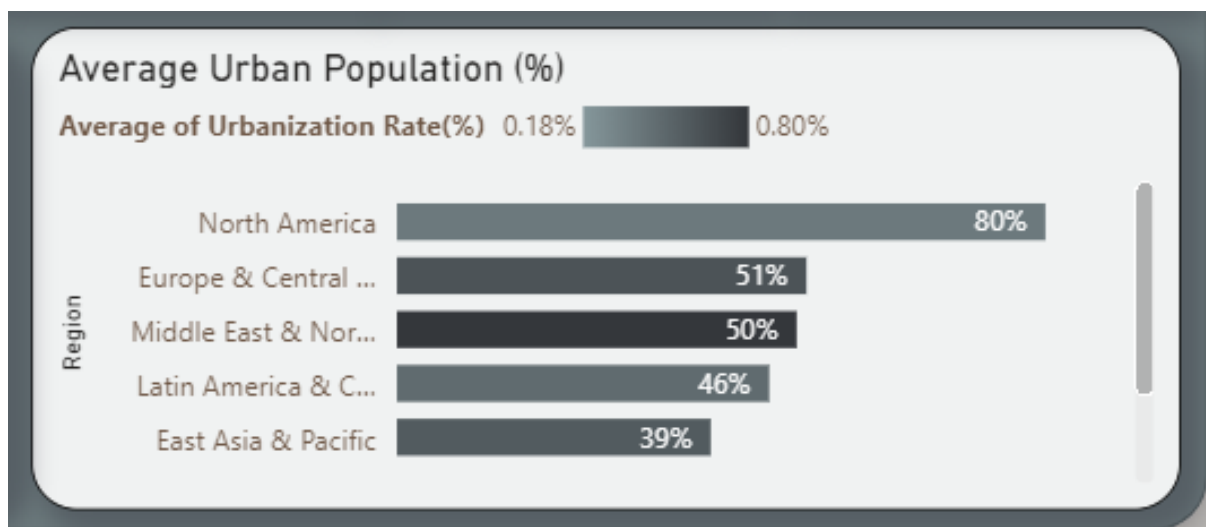


Figure Error! No text of specified style in document..22 Bar chart showing the average urban population, shaded with the average urbanization growth rate

Although North America has a higher percentage of urban population, the Middle East had a higher growth in their urban population, this is indicated by the darker shade of the bar due to the urbanization rate.

1.3.6 Dual Y-Axis Line Chart: Population Growth vs. Urbanization Rate

A dual Y-axis line chart was used to show the trend of Population Growth and Urbanization Rate Growth over time. While dual Y-axes can sometimes be complex, it's effective here due to the close correlation between these metrics.

The chart was built by plotting Population Growth Rate on the left Y-axis, and Urbanization Rate Growth on the right Y-axis. The X-axis represents the year, the chart shows the trend of both metrics over time.

The lines were color-coded for easy differentiation and tooltips were added, showing values for population growth and urbanization for each year.

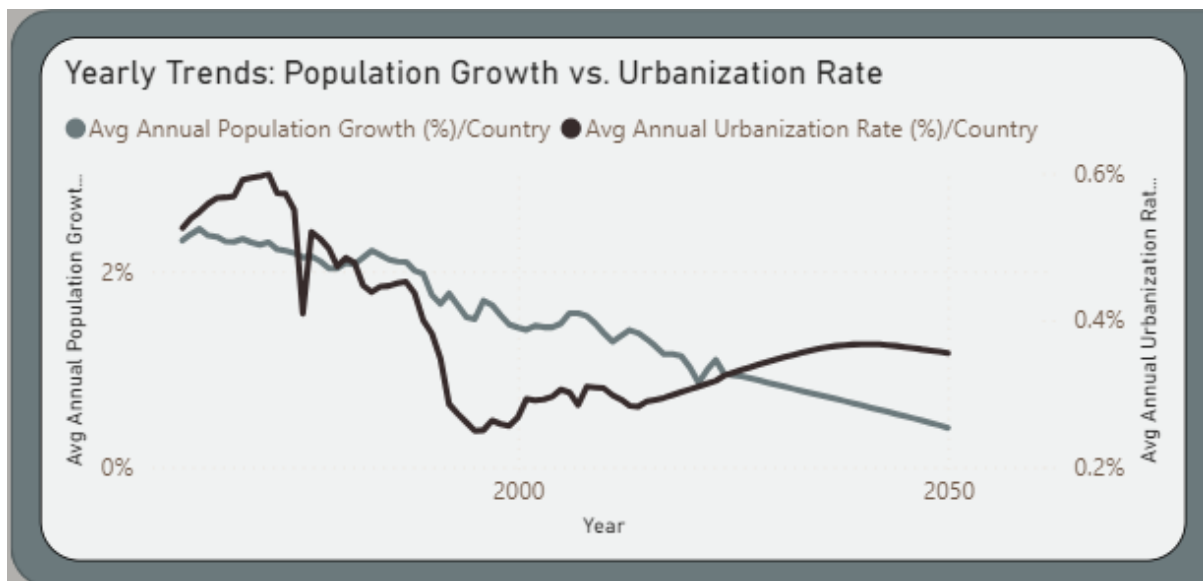


Figure Error! No text of specified style in document..23 Line chart showing yearly trends in population growth and urbanization rate

1.3.7 Stacked Bar Chart: Annual Population Growth

A stacked bar chart was selected to visualize the average annual population growth by both region and income group. This allows easy visualization of each region's total population growth as a single bar, with segments representing different income levels stacked within.

The chart plots the geographical hierarchy (region and country) on the Y-axis and the average population growth on the X-axis. This allows easy accessibility to country-level information by drilling down the chart.

Tooltips were used to add additional information like the number of countries in the group, without overcrowding the visual. Positioned at the bottom right of the dashboard, this stacked bar chart provides a detailed breakdown of population growth by region and income group, complementing the higher-level summary visuals above.

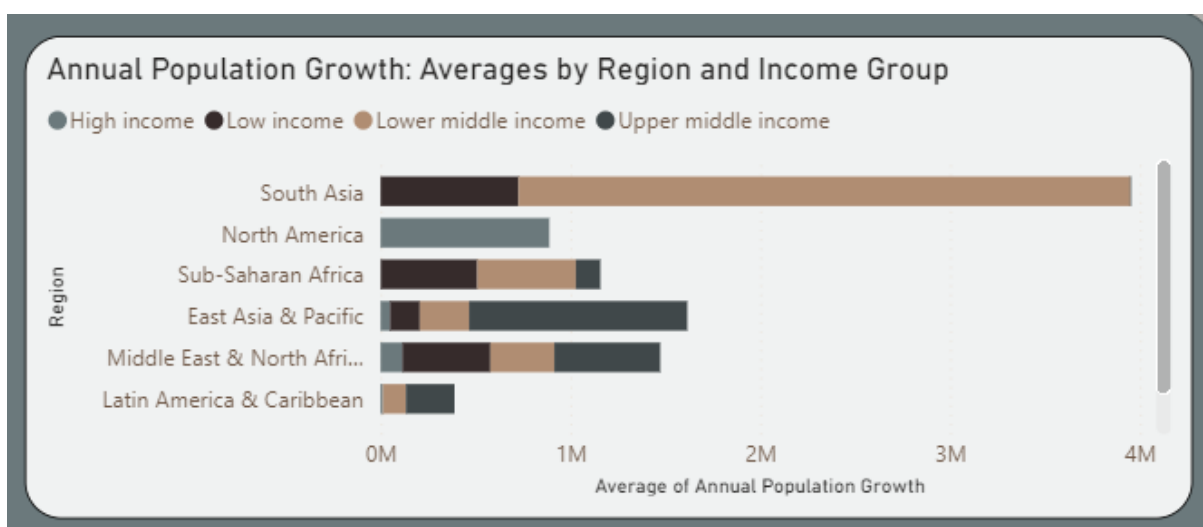


Figure Error! No text of specified style in document..24 Stacked bar chart showing annual population growth for each income group in each region

1.4 Critical Evaluation

1.4.1 Strengths

- **Dynamic title:** The dynamic title ensures that the title conveys exactly what the dashboard is displaying, even after slicing.
- **High-Level Summaries:** The KPI cards at the top introduce the dashboard with a quick summary, providing immediate insights.
- **Seamless Flow:** The dashboard layout progressed from displaying summary insights at the top to detailed breakdowns of the information at the bottom.
- **Use of Color:** The colour scheme chosen was consistent throughout the dashboard, and the choice of colour created an appealing visual.
- **Interactive Elements:** The slicer panel enabled the dashboard to be sliced based on year, region, and income group, increasing the interactivity of the dashboard. The "Historical" and "Projected" slicer allows easy toggle between past data and future projections effortlessly.

1.4.2 Limitations

- **Dual Y-Axis Line Chart:** The dual Y-axis line chart can be easily misinterpreted due to its complexity.
- **Space Utilization:** The slicer panel takes up space and could be optimized by using a collapsible slicer panel instead.
- **Limited Space:** The Dual Y-axis line chart could have been separated if more space was available.

1.4.3 Conclusion

The interactive dashboard “**A World in Transition: Glimpse into Growth**” effectively achieves its purpose by capturing growth both in population and urbanization and also health across income groups, regions and even countries. The interactive nature of this dashboard allows it to effectively capture past trends and even future trends in growth, making complex data accessible and also engaging.

Each visual was carefully selected to explore both casually and in-depth, providing broad summaries and also deep dives into specific details. Conditional formatting and tooltips were also used to provide additional information enhancing user experience.

Overall, this interactive dashboard can serve as a resource for policymakers, NGOs, and researchers, telling the story of change, enabling them to understand these changes and make data-driven decisions.