Business Intelligence System Infrastructure

Data Visualization Topics

Algonquin College
23W_CST2106_010

Project: Growth of world population and
prediction

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- **EXECUTIVE SUMMARY**

The world population is defined as the total number of humans currently living in the world. According to the United Nations, the global population reached eight billion in November 2022 as compared to six million in 1999. This rapid growth of the world's population can be attributed to several factors which can be endogenous as well as exogenous.
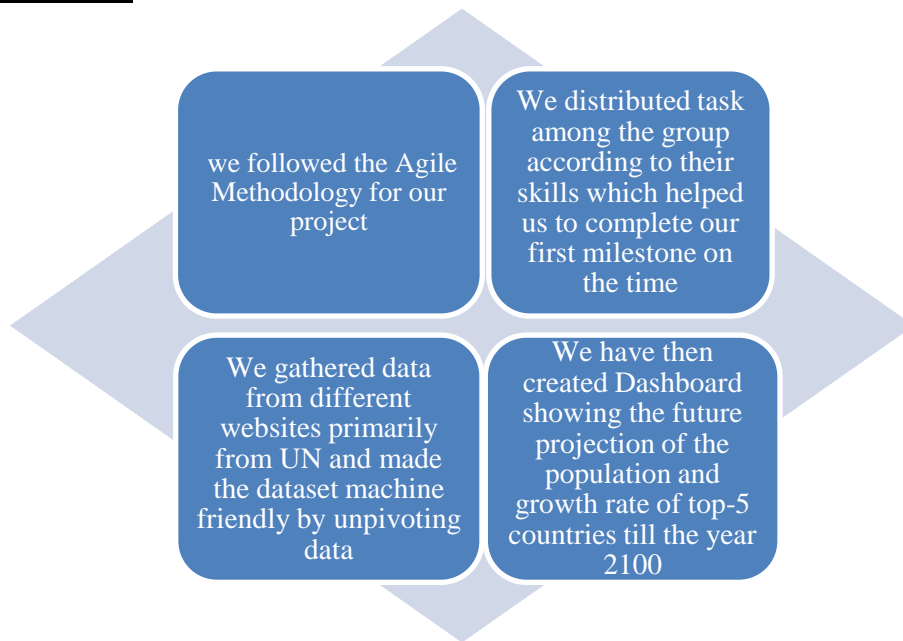
For our study, we collected our dataset from the United Nations. We used the agile approach and the Gantt chart to plan our project methodology, each group member being responsible for a specific attributed task. We performed exploratory data analysis by handling nulls and missing values to have a cleaned dataset. Out of the countries we plotted with Power BI, the top five countries in terms of population were India, China, Pakistan, United States, and Indonesia. We further investigated to know what the trends of the contributing factors in these countries are. We discovered that birth rate, fertility rate, death rate, deaths vs Birth rate, GDP (Gross Domestic Product) spent on healthcare, literacy had a significant impact in those countries.

- **BACKGROUND**

The United Nations predicts that the world population will reach 9.7 billion by 2050 and 10.9 billion by 2100. This rapid population growth has a serious impact on social economic and environmental life (food security, healthcare, urbanization, climate change, and biodiversity loss). There is a useful need to understand this trend so that countries, Non-Governmental Organizations, and stakeholders can put in place measures to tackle this global concern.

- **ANALYSIS**
  - ❖ **Work methodology**

we followed the Agile Methodology for our project

We distributed task among the group according to their skills which helped us to complete our first milestone on the time

We gathered data from different websites primarily from UN and made the dataset machine friendly by unpivoting data

We have then created Dashboard showing the future projection of the population and growth rate of top-5 countries till the year 2100

- After completing major works, we found that we can add more topics which are related to world population like Birth Rate, Death Rate, Fertility, Literacy Rate, Healthcare so we divided these topics with team members, and tried to find useful data.
- After that, different topics are assigned to everyone and then after we all reviewed each other's graphs and storyline, if there were any changes then we suggested each other.
- We completed all the charts and prepared stories before the last 2 weeks.
- So before 2 weeks our charts were basic and covering all the information but not good for visualization so in the last 2 weeks, we all divided work for giving last touch to our project, so for that Dhruv and Antriksha worked for better visualization of the graphs like different type of slicer, filter, color combination, background, and PowerPoint Presentation, on the other hand Jay and Gabriel worked for Documentation.
- On the very last day everyone reviewed each other's work and suggested some changes, so we all together worked equally for giving our final project.

  - ❖ **Results**

We plotted several charts that gave us some insights into future growth in population, so here we are mentioning important topics.

  - ➢ Topic 1: Future population projection of the top-5 countries
  - ➢ Topic 2: Birth Rate-Death Rate-Fertility Rate of the top 5 countries
  - ➢ Topic 3: Deaths vs Birth rate of the World
  - ➢ Topic 4: Percentage of GDP spent on healthcare.
  - ➢ Topic 5: Literacy rate by year by country

Topic 1: Future population projection of the top-5 countries

The top 5 countries in terms of population are **India, China, Pakistan, United States, and Indonesia**.

In India, the population will keep increasing until 2040. This is primarily due to factors such as high fertility rates, increased life expectancy and a young population with a large proportion of women in childbearing age. From 2050 we will notice a constant stabilization trend until 2060. The Indian government has started promoting family planning (decrease in birth rate) and providing better healthcare access. There will be a slight drop from 2080 till 2100 caused by continuous decline in fertility rates (since many people are getting more educated and urbanized), aging population (particularly if the number of deaths exceeds the number of birth), environmental factors like climate change and disease outbreak. It is wort noting that the healthcare access is improving in India, but the country is still vulnerable to infectious diseases.

In China we have a plateau between 2010 and 2020. This can be attributed to the one child policy that was introduced in 1979 though it was relaxed in 2015 and its effects are still being felt today and, in the years to come. Other contributing factors are population aging, urbanization and improved healthcare. There is an important drop from 2030 until 2100 caused by continued low fertility rates. Though the one-child policy has been relaxed in 2015, many couples are still choosing to have fewer children or delay children due to the high cost of living and education, changing social values and the increased participation of women in the workforce.

Pakistan's population is currently at a slow but steady pace and the same trend might occur towards 2100. This is due to high fertility rates (3.5 births/woman). Limited access to family planning services is also affecting the population as many women still lack theses services and there is a significant unmet need for contraception which contributes to high fertility rate. Another contributing factor is the young population which is around two-thirds of the population under the age of 30. This means there is a large potential for population growth through natural increase.

The United States population follows the same pattern as Pakistan. This is mainly due to immigration as the United States is a popular destination for immigrants. The natural increase is also due to the relatively high fertility rate. Longer life expectancy caused by improved healthcare and living conditions is another contributing factor to the United States population.

Indonesia's population is growing at a slow steady pace as well due to high fertility rates (average around 2.4 births/woman in 2021), young population (with around 40% of the population under the age of 25), economic development and improvements in healthcare. Indonesia is also experiencing rapid urbanization with more and more people moving from rural areas to cities.

Topic 2: Birth Rate-Death Rate-Fertility Rate of the top 5 countries

In all the countries mentioned, birth rates decrease from 1950 till 2100 in all the countries. In the United States, factors such as economic prosperity, increased education and access to contraceptive technology have contributed to the decline in birth rates. The cultural shift towards individualism and gender equality has also played a role. In India, the decline is due to increased access to family planning, education, urbanization, and government policies (National Population Policy) to encourage smaller family sizes. In Indonesia, it has declined due to increased access to family planning and healthcare and urbanization. In China, the one-child policy which was implemented in 1979 and relaxed in 2015 was a significant factor in reducing the birth rate. Other factors include increased access to family planning, education, and economic development. In Pakistan, these factors include increased access to education and healthcare, poverty, gender inequality and cultural shifts towards smaller family sizes.

The death rates in those countries started dropping in 1950 till 2020 and with a steady rise afterwards. Common causes of that decline include advancements in healthcare and medical technology, as well as public health interventions such as vaccination campaigns and disease control programs. But the steady rise is specific to each country. In the United States, the steady rise in death rates can be attributed to opioid epidemic and increasing rates of suicide. In India, this rise can be attributed to factors such as air pollution non-communicable diseases and inadequate healthcare infrastructure. In Indonesia, the rise is due to increasing burden of non-communicable diseases such as cardiovascular disease, cancer and diabetes. In China as well, this can be attributed to increasing burden of non-communicable diseases, air pollution and aging population. In Pakistan, it can be attributed to factors such as air pollution, water-borne diseases, inadequate healthcare infrastructure.

For the fertility rate there is a slight decrease around 1990 and a stabilization plateau from 2000 till 2100. Common causes include increased access to family planning and contraception, improved healthcare, education and changing social attitudes towards family size. In the United States specifically, the plateau may be due to several factors such as increasing immigration, a higher proportion of women delaying childbirth until their 30s or 40s and the fact that many women are choosing to have fewer children overall. In India and Indonesia, it may be due to factors such as a shift towards smaller family sizes and increase in the use of modern contraception. In China, it may be due to the relaxation of the one-child policy, an increase in the number of women delaying childbirth. In Pakistan, it may be due to the continued availability and use of modern contraception.

Topic 3: Deaths vs Birth rate of the World

The chart compares the death vs birth rate of the world from 1950 till 2021. We noticed there was the birth rate is far higher than the death rate in the world.

➢ Possible reasons include advances in medicine which have led to improvements in healthcare with increased life expectancy and reduced mortality rates.

➢ Improved access to nutrition and food supplies have contributed to the reduction in mortality rates, particularly in developing countries.

➢ Increased access to education and women's empowerment has led to changes in family planning and a reduction in the number of children per family.

➢ Religious and cultural beliefs also contribute to increased birth rates. These beliefs place a high value on having large families which can contribute to higher fertility rates.

However, some countries continue to face high mortality rates due to factors such as poverty, conflict, and disease.

Topic 4: Percentage of GDP spent on healthcare.

There is an increase in the percentage GDP spent on healthcare from China, India, Indonesia, Pakistan to the United States, the latter having the highest GDP. This may be attributed to the following factors:

➢ High productivity: The United States has a highly productive economy, with high levels of investment in research and development, technology, and infrastructure. This has allowed the country to develop and utilize advanced technology and production methods to produce goods and services efficiently.

➢ A large and diverse economy with a wide range of industries and sectors (manufacturing, services, finances) which allows the economy to withstand shocks and adapt to changes in global demand and supply.

➢ Skilled labor force which is critical to innovation, productivity, and competitiveness in a global economy.

➢ A stable political and legal environment that promotes investment and business growth allowing business to operate with greater certainty.

Topic 5: Literacy rate by year by country

The United States has the highest literacy rate over the years from 1950 till 2021 as compared to the other countries. One reason is since the country has a strong and well-established education system that provides access to education for a large percentage of the population. Public education is free and compulsory for children up to a certain age. Secondly, there is a widespread availability of books, newspapers and other media that contributes to literacy rates. In addition, the country has a robust job market that rewards individuals with higher levels of education and literacy and many employers provide opportunities for their employees to continue their education while working.

Pakistan is on the other hand has the least literacy rate as compared to other countries. This can be caused by several factors. Their education system is inadequate with a lack of funding and resources. There is also political instability with frequent changes in policies and leadership resulting in a lack of consistency and coherence in educational initiatives. In addition, a large portion of the population lives in poverty, making it difficult for families to afford education expenses such as school fees, uniforms, and books. Children are often forced to support their families instead of attending school. Moreover, some cultural and social norms in Pakistan discourage girls and women from receiving an education, resulting in significant gender gap in literacy rates.

- ## **CONCLUSION AND RECOMMENDATIONS**

The growth of world population is a global concern as it has an impact on social, economic, and environmental life. From our dataset, the top 5 countries in terms in population are India, China, Pakistan, United States, and Indonesia. We found out that there are many factors that affect the world population in those countries such as the birth rate, death rate, fertility rate, GDP, and literacy rate. These factors help us understand some underlying common root causes but also those that are specific to each country. If this growth prediction is not well managed it will put increasing pressure on resources and infrastructures and could exacerbate issues such as poverty, inequality, and environmental degradation. Therefore, national policies need to implement measures to tackle this issue. Our recommendations to address this challenge are the following:

➢ Investing in healthcare and education can help reduce fertility rates.

➢ Increasing access to family planning services by ensuring that individuals have access to contraceptive options that can help prevent unintended pregnancies.

➢ Addressing poverty and inequality can help improve living conditions for populations and promote sustainable development.

➢ Fostering international cooperation between countries.

- ## **REFERENCES**

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