

Advanced Data Visualization

Experiment - 1

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BE COMPS A - BATCH H

Aim:

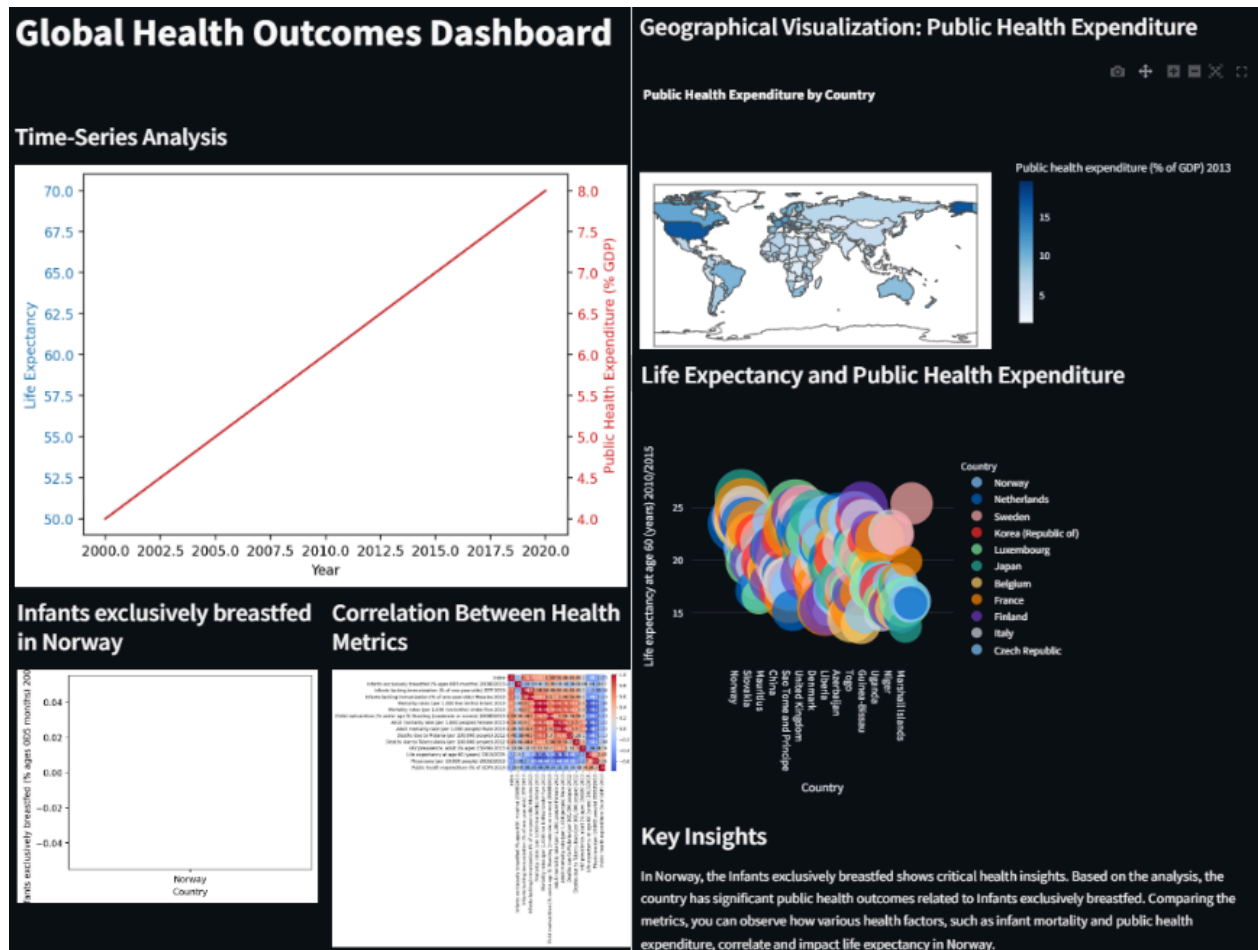
Design Interactive Dashboards and Storytelling using Tableau / Power BI / R (Shiny) / Python(Streamlit/Flask) / D3.js to be performed on the dataset - Disease spread /Healthcare.

Dataset:

The dataset contains 196 rows and 16 columns, focusing on various health indicators across countries. Here's a breakdown of the columns:

1. Country: The name of the country or region.
 2. Infants exclusively breastfed (% ages 0-5 months) 2008-2013: Percentage of infants exclusively breastfed in the given period.
 3. Infants lacking immunization (% of one-year-olds) DTP 2013: Percentage of one-year-old infants missing DTP (Diphtheria, Tetanus, and Pertussis) immunization.
 4. Infants lacking immunization (% of one-year-olds) Measles 2013: Percentage of one-year-olds without measles immunization.
 5. Mortality rates (per 1,000 live births) Infant 2013: Infant mortality rate.
 6. Mortality rates (per 1,000 live births) Under-five 2013: Under-five child mortality rate.
 7. Child malnutrition (% under age 5) Stunting (moderate or severe) 2008-2013: Percentage of children under 5 with stunted growth.
 8. Adult mortality rate (per 1,000 people) Female 2013: Adult female mortality rate.
 9. Adult mortality rate (per 1,000 people) Male 2013: Adult male mortality rate.
 10. Deaths due to Malaria (per 100,000 people) 2012: Deaths caused by malaria.
 11. Deaths due to Tuberculosis (per 100,000 people) 2012: Deaths due to tuberculosis.
 12. HIV prevalence, adult (% ages 15-49) 2013: Percentage of adults (aged 15-49) living with HIV.
 13. Life expectancy at age 60 (years) 2010/2015: Average life expectancy at age 60.
 14. Physicians (per 10,000 people) 2001-2013: Number of physicians per 10,000 people.
 15. Public health expenditure (% of GDP) 2013: Percentage of GDP spent on public health.
- The dataset includes a mix of demographic, mortality, and health expenditure data.
 - Some columns have missing values, particularly for immunization, malnutrition, and disease-related deaths.

Dashboard:



1. Time-Series Analysis: Life Expectancy and Public Health Expenditure (Top Left)

- **Visualization:** A time-series plot (2000-2020) showing an upward trend in life expectancy (left y-axis, in blue) and public health expenditure as a percentage of GDP (right y-axis, in red).
- **Analysis:** There seems to be a positive correlation between life expectancy and public health expenditure. Over the years, as countries spend more on healthcare (percentage of GDP), life expectancy also tends to increase. This suggests that investments in healthcare likely contribute to improved health outcomes.

2. Geographical Visualization: Public Health Expenditure (Top Right)

- **Visualization:** A world map shaded to represent public health expenditure (% of GDP) by country in 2013.
- **Analysis:** Darker colors represent higher expenditure. Countries in Europe and parts of

North America seem to have higher percentages of GDP allocated to health, while many countries in Africa and parts of Asia have lower health expenditures. This geographical disparity can highlight differences in healthcare investment and likely reflects variations in health outcomes between regions.

3. Life Expectancy and Public Health Expenditure (Bubble Plot, Middle Right)

- **Visualization:** A bubble plot comparing life expectancy (y-axis) with public health expenditure (x-axis) for various countries. Each bubble represents a country, and its size may represent population size or another health-related factor.
- **Analysis:** Countries with higher health expenditures (right side of the plot) generally have higher life expectancies (upper part of the plot). For example, Norway, Luxembourg, and Japan appear in the upper-right region, indicating high health expenditure and life expectancy. Meanwhile, countries like the Czech Republic and Italy fall lower, indicating slightly lower health expenditure and life expectancy.

4. Infants Exclusively Breastfed in Norway (Bottom Left)

- **Visualization:** A boxplot or similar graph showing data for infants exclusively breastfed in Norway.
- **Analysis:** This graph reflects the rates of infants exclusively breastfed in Norway, which can be linked to broader public health outcomes. Breastfeeding is often associated with better early childhood health, which may be one of the health metrics contributing to Norway's higher life expectancy and overall public health quality.

5. Correlation Between Health Metrics (Middle Bottom)

- **Visualization:** A heatmap showing correlations between different health metrics.
- **Analysis:** The heatmap shows various correlations between public health-related variables. Strong positive correlations are shaded in red, and negative correlations are shaded in blue. Metrics like infant mortality, public health expenditure, life expectancy, and breastfeeding rates are likely included. Positive correlations suggest that as one metric improves (e.g., increased healthcare spending), others (like life expectancy) may also improve.

6. Key Insights (Bottom Right)

- **Insights:**
 - Norway, used as an example, has significant public health outcomes tied to breastfeeding rates.
 - Public health expenditure and infant mortality metrics provide important correlations that contribute to life expectancy. For instance, as infant mortality decreases and public health expenditure rises, life expectancy tends to increase.

Overall Analysis:

This dashboard demonstrates the strong relationships between healthcare investment, infant health practices (like breastfeeding), and broader health outcomes such as life expectancy. Countries with higher public health expenditures tend to have better overall health outcomes, as seen in higher life expectancies. The geographical and correlation analysis highlights global disparities and can guide policymakers in targeting investments to improve public health.

Conclusion:

The analysis of global health outcomes through various metrics, including public health expenditure, life expectancy, and infant health indicators, reveals a clear relationship between healthcare investment and overall public health. The key conclusions are:

1. **Positive Correlation Between Public Health Expenditure and Life Expectancy:** Countries that allocate a higher percentage of their GDP to public health tend to have longer life expectancies. This suggests that sustained investment in healthcare infrastructure, services, and programs directly contributes to improving a population's health.
2. **Geographical Disparities:** There is a significant variation in public health expenditure across different regions. Developed countries, particularly in Europe and parts of North America, invest more in healthcare compared to many developing nations, which could explain the gap in health outcomes, particularly life expectancy, between these regions.
3. **Infant Health as a Critical Factor:** Indicators like the rate of infants exclusively breastfed play a crucial role in shaping broader health outcomes. Countries that prioritize early childhood health practices tend to exhibit better long-term health results, such as lower infant mortality and higher life expectancy.
4. **Strong Interconnectedness of Health Metrics:** The correlation heatmap highlights the interconnected nature of various health metrics. Improvements in one area, such as reducing infant mortality or increasing breastfeeding rates, often correlate with better outcomes in other areas like life expectancy.

This experiment underscores the importance of targeted investments in public health systems. By focusing resources on both preventive measures, such as improving early childhood health, and sustained healthcare funding, countries can enhance the overall health and well-being of their populations. Addressing geographical disparities in health expenditure is critical to improving global health equity.