**Country Health Index (CHI)**

**Data Analysis and Visualization Documentation**

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**Theoretical Framework**

The Country Healthy Index (CHI) is a composite Index designed to measure the health of a given country based on an assessment of various health, social and environment indicators to get a comprehensive view of the country’s medical and health landscape, after assessment of each variable the CDI then provides a ranking between 0-100 with 0 being the least healthiest country and 100 being the healthiest country. By focusing on these various aspects of the country’s society, healthcare system, environmental landscape, this index aims to highlight not only direct health outcomes among the population but also underlaying systemic factors that may contribute the country’s overall health.

**Dimensions:**

The Country Healthy Index (CHI) employs the following Dimensions to seek a comprehensive view of the country’s health:

**Longevity:**

Longevity refers to the average overall life expectancy of a country’s population, it provides a simple metric for how long a person is expected to live in each society. Countries with higher life expectancies generally have better access to healthcare, better healthcare quality, better socioeconomic conditions, healthier lifestyles etc. The longevity dimension will be sourced from life expectancy data.

* **Theoretical Basis**: Longevity is influenced by various factors including access to healthcare, lifestyle habits, environmental influences, social economic conditions etc. all of which influence a country’s overall health

**Access to Healthcare:**

Access to healthcare measures how easy it is for a countries population to receive healthcare. This includes availability of healthcare facilities, access to doctors, density of patients to doctors etc. Countries with a higher access to health care will generally have better health outcomes as patients receive the care, they need without any major barriers, saving lives.

* **Theoretical Basis:** According to the World Health Organization (WHO), access to healthcare is a critical determiner of health equity. It affects how well people can manager their health, avoid preventable diseases, receive treatment on time. While poor access to healthcare shows disparities in healthcare outcomes and greater mortalities **(World Health Organization, 2025)**.

**Health Outcomes:**

Health outcomes are measures that directly reflect the physical wellbeing of a country’s population. These can include metrics such as infant mortality rates, maternal mortality rates, morbidity rates etc. Positive Health Outcomes are generally associated with higher standards of healthcare, healthier lifestyles and better environmental conditions in the given country.

* **Theoretical Basis:** Health outcomes are a direct result of the interactions between healthcare systems, behaviour, environmental factors, genetics etc. Health disparities often arise in these areas and outcomes serve as a reflection of the country’s healthcare system efficiency and equity **(World Health Organization, 2025)**.

**Financial Risk:**

Financial risk refers to the economic burden of the healthcare in a country. This can include the cost of medical treatments, out of pocket expenditure for patients, etc. Countries with a high financial risk may face issues such as healthcare inequity where only the wealthiest can afford healthcare or economic instability which may result in reduced investment into healthcare.

* **Theoretical Basis:** The availability of funds for healthcare directly affects the quality and accessibility of healthcare services. Countries with higher healthcare costs or significant financial barriers to healthcare may have worse health outcomes due to uneven access to healthcare as only the richest can afford it leaving many without adequate healthcare.

**Environmental Factors:**

Environmental Factors encompass the physical and social environments in which a country’s population lives. Air quality, water quality, sanitation, climate conditions etc. are all environmental factors that can play a role in the health of the people who live there. Air pollution can have negative health impacts and result in the prevalence of respiratory illnesses.

* **Theoretical Basis:** Environmental Factors play a critical role in public health, as living conditions, air quality, pollution, and sanitation directly affect the population as poor environmental and living conditions results in a reduced quality of life and a decline in health and an increase prevalence of diseases and illnesses. A healthier environment supports better quality of life and reduced healthcare needs.

**Data Source:**

The data for constructing the Country Health Index (CHI) will be sourced from the following dataset:

**Global Country Information Dataset 2023:**

The “Countries of the World 2023” provides global statistics on various health, economic, demographic factors, and other factors influencing health outcomes that will be instrumental in calculating each dimension of the CHI

**Source:** [**https://www.kaggle.com/datasets/nelgiriyewithana/countries-of-the-world-2023**](https://www.kaggle.com/datasets/nelgiriyewithana/countries-of-the-world-2023)

**Data Selection**

For the development of the Country Healthy Index (CHI), I have chosen a set of variables from the “Countries of the World 2023” dataset that I believe provide a comprehensive view of the country’s health status, while adhering to the above defined dimensions in the theoretical framework and they reflect various aspects such as healthcare outcomes, healthcare access, environmental factors, etc. Below are the specific variables I am using:

**Life Expectancy:**

Life expectancy refers to the average number of years that a newborn is expected to live. Life expectancy is one of the most common indicators of a country’s overall health. It gives me a clear picture of how long people can expect to live, which is influenced by factors such as healthcare quality, lifestyle and socioeconomic conditions. Countries with higher life expectancies tend to have better healthcare systems and healthier populations so it’s a key measure for my Index.

**Physicians per thousand:**

This variable measures the number of physicians (doctors) available per 1000 people in a country. Access to healthcare is a crucial factor with regards to health outcomes and numbers of physicians per 1000 people is a direct measure of healthcare accessibility and shows the density of doctor to patients. More physicians mean better access to care and less overall strain on the country’s healthcare system, fewer physicians mean greater overall strain on the system and poorer access to healthcare, greater wait times etc. leading to a greater influence on health outcomes. This variable will help me determine how well distributed healthcare services are in each country.

Infant Mortality:

Infant morality refers to the number of deaths of infants under the age of 1 per 1000 live births. Infant mortality is a strong indicator of a country’s healthcare system effectiveness, especially in relation to pregnancy health care and post pregnancy healthcare. A high infant mortality rate generally points to deficiencies in the country’s healthcare system, poor environmental conditions, poor sanitation, poor nutrition etc. As such I believe this variable will provide significant insights into the quality of healthcare in each country.

Maternal Mortality Ratio:

This variable is a ratio between the number of maternal deaths per 100,000 live births due to complications caused by pregnancy or childbirth. Maternal Mortality is another important health indicator as it reflects the quality and accessibility to maternal healthcare. A high maternal mortality rate suggests inadequate access to healthcare or poor quality

* Life expectancy
* Physicians per thousand
* Infant mortality
* Maternal mortality ratio
* Out of pocket health expenditure
* Co2-Emissions

**Imputation of Missing Data**

**Multivariate Analysis**

**Normalisation**

**Weighing and Aggregation**

**Links to other Indicators**

**Visualisation of the Results**

**Conclusion**

**References**

World Health Organization (2025). *Health equity*. [online] World Health Organization. Available at: <https://www.who.int/health-topics/health-equity#tab=tab_1>.

ELGIRIYEWITHANA, N. (2023). *Global Country Information Dataset 2023*. [online] www.kaggle.com. Available at: <https://www.kaggle.com/datasets/nelgiriyewithana/countries-of-the-world-2023>.

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**ChatGPT for assistance with the development of the CHI in Jupyter Notebook:**

ChatGPT. (2025). *ChatGPT - New chat*. [online] Available at: <https://chatgpt.com/share/68166c24-14cc-8007-a343-b1b7946badd2>.

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