HDI vs GDP Per Capita Visualization

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I. Introduction

Global development remains an ongoing challenge, as disparities in income and well-being continue to define the divide between developed and developing countries. While GDP per capita remains a common prosperity metric, it falls short in capturing crucial dimensions of quality of life like education and healthcare. The Human Development Index (HDI), a composite measure of income, life expectancy, and schooling, offers a more holistic benchmark, yet even it may not fully reveal the complex interplay of factors driving inequality across nations
Our project builds upon the Our World in Data visualization of HDI vs. GDP per capita (2023), which effectively uses population-sized bubbles and region-based coloring to enhance its analytical depth. Through targeted refinements and potential integration of additional socio-economic dimensions, we aim to uncover more nuanced patterns in global development, highlight persistent gaps in human well-being, and provide a clearer visual narrative to inform crucial discussions on global inequality and progress.

II. Original Visualization

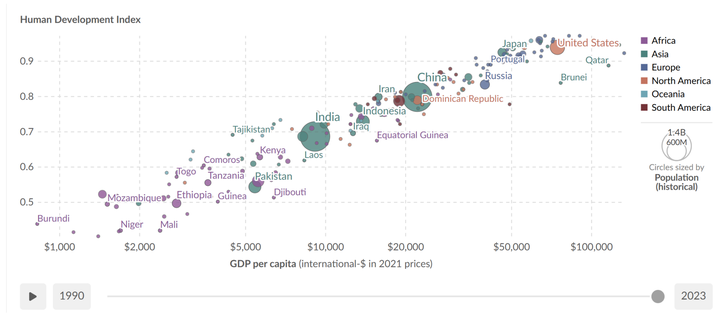

Figure 1: HDI vs GDP per Capita

III. Critical Assessment of Original Visualization

i. Strengths

1. **Clear Correlation Between GDP and HDI** : The scatter plot successfully reveals a strong positive relationship between a country's GDP per capita and HDI.
2. **Interactive and Engaging with Tooltips** : Users can hover over each bubble to reveal country-specific information, enhancing explorations
3. **Use of Globally Recognized Indicators** : Both GDP per capita and HDI are well recognized to both general audiences and experts.
4. **Temporal Slider Enables Yearly Comparisons** : The time slider allows users to explore how the relationship evolves over time.
5. **Colour-Coded by Region for Broad Comparison** : Colour coding helps compare regions and spot patterns
6. **Bubble Size Reflects Population** : The use of proportional bubble sizing adds depth and highlights the influence of large countries
7. **Log Scale Compresses Wide GDP Range** : A logarithmic scale on the x-axis displays wide GPD ranges clearly

ii. Weaknesses

1. **Axis Labels lack clarity, not enough intuitive context**: The x- and y-axis labels lack intuitive explanations, may confuse non-technical users
2. **Overlapping points in dense regions**: In low-GDP regions, many data points overlap, making it difficult to distinguish individual countries and reducing readability.
3. **No trendlines/regression analysis**: The lack of a fitted line limits the user's ability to assess the strength and consistency of the correlation quantitatively.
4. **No filters options**: Users cannot filter the dataset by region, income group or custom years
5. **Low contrast thus not colour-blind friendly**: Some region colours are low in contrast and may not be distinguishable by colour-blind users.
6. **Bubbles sizing overshadow smaller countries**: Big population bubbles overshadown smaller countries, making it hard to see their data points
7. **Population sizing methodology unclear**: It is unclear whether population sizes are static or dynamic over time as the bubble is not showing distinct changes.

IV. Suggested Improvements

1. **Define a Clear Narrative**: Establish a clear distinction between developed and developing countries using HDI and GDP thresholds to guide interpretation and analysis.
2. **Contextual Bands Along X & Y Axes**: Add labeled bands along both HDI and GDP axes to visually segment income and development categories, improving clarity and comparative insight.
3. **Boundary Threshold Lines for Developed vs Developing Classification**: Introduce boundary lines to clearly demarcate developed from developing countries within the scatterplot.
4. **Filters by Development Status, Region, and Year**: Implement filters that allow users to isolate countries by development status, geographic region, or custom year ranges for more focused exploration.
5. **Dynamic Yearly Summary Panel**: Provide a yearly statistics panel displaying average, median, min, and max values of HDI and GDP for both developed and developing groups.
6. **Improve Visual Accessibility and Clarity**: Reduce bubble overlap in dense areas through jittering and zoom features, and apply colorblind-safe palettes to ensure accessibility for all users.
7. **Animated Time lapse with Annotations**: Integrate an animated timeline to show changes from 1990–2023, with pauses and annotations at key milestones to emphasize global development trends.

V. Implementation

i. Data Source

UNDP – Human Development Report (2025), Eurostat, OECD, and World Bank (2025) ,HYDE (2023) – History Database of the Global Environment, Gapminder – Population v7 (2022), UN – World Population Prospects (2024), Gapminder – Systema Globalis (2022), Our World in Data – with major processing by Our World in Data

ii. Software

We used R and a range of packages to clean, analyze, and visualize the data:

- readr – for importing cleaned CSV files
- dplyr – for filtering, grouping, and summarising data
- ggplot2 – for static visualizations such as boxplots and scatter plots
- plotly – for interactive and animated development plots
- scales – to format axis labels and numerical values clearly
- tibble – to define development bands used in visual overlays
- stats – to compute correlations, trends, and regression models

iii. Workflow

1) Exploratory Data Analysis:

- Inspect the data structure using glimpse() and summary()
- Identify the number of unique country entities.
- Filter the dataset to include only the years from 1990 to 2023
- Validate and retain only valid 3-letter country codes
- Rename key variables for clarity and drop rows with missing HDI or GDP values
- Fill missing owid_region values by referencing each country's region from its 2023 observation

2) Feature Engineering:

- Classify countries as "Developed" or "Developing" based on HDI and GDP thresholds
- Create hdi band categories based on UNDP classification thresholds
- Create gdp band categories based on GDP per capita thresholds (aligned with World Bank income groupings)

3) Data Visualization:

VI. Improved Visualization

VII. Further Improvements

VIII. References

IX. Further Reading