Global Burden of Disease EDA

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What is this project?

- The global burden of disease is a critical metric used by health organizations and governments to understand the impact of diseases, injuries, and risk factors across populations.
- This project focuses on analyzing data from the Global Burden of Disease study, which provides comprehensive estimates for mortality and health loss for major diseases and risk factors across various countries and regions.

Problem Statement

- To understand the leading causes of death and disability from different regions, groups and eras for improved public health strategies.
- In order to do this we have to transform the dataset into actionable insights through data preprocessing and visualization.
- This involves identifying trends over time, analyzing death rates across countries, and investigating the influence of factors such as age and sex on mortality. The goal is to derive clear, data-supported insights that contribute to a better understanding of global health challenges.

Dataset description

- This dataset includes estimates related to the global burden of disease, injuries, and risk factors, collected for the years **1990 and 2010**. **Geographic Regions** (global and 21 regions)
- **Countries**
- **Causes of Death**
- **Risk Factors**
- **Age Groups**
- **Sex**
- **Death Rates and Counts**

Dataset Information:

Number of Rows	Number of Columns	Timespan	Number of Countries	Age Groups	Sex Categories
58905	7	1970 - 2010	187	21	3

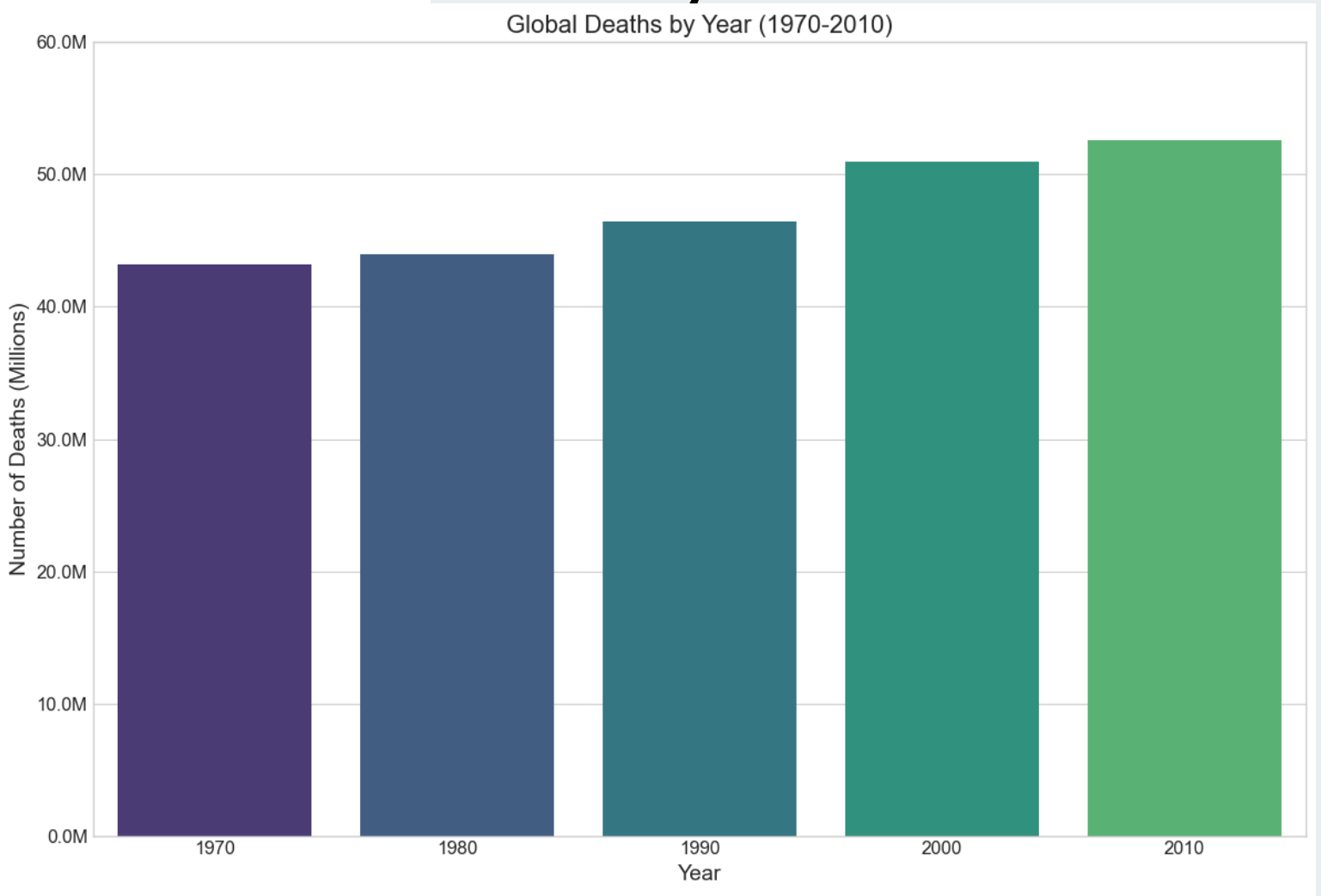
Data analysis

- Load the csv file in.
- Get a look at the dataset information and convert number of deaths and death rate to float.
- Performed statistical analysis including cross-tabulation between the numeric columns.
- Data Cleaning & Preprocessing (Missing values, special values & Outliers, duplicate values, normalization & scaling and more).
- EDA and visualization on trends.
- Generating key findings and actionable insights.

EDA and visualization charts

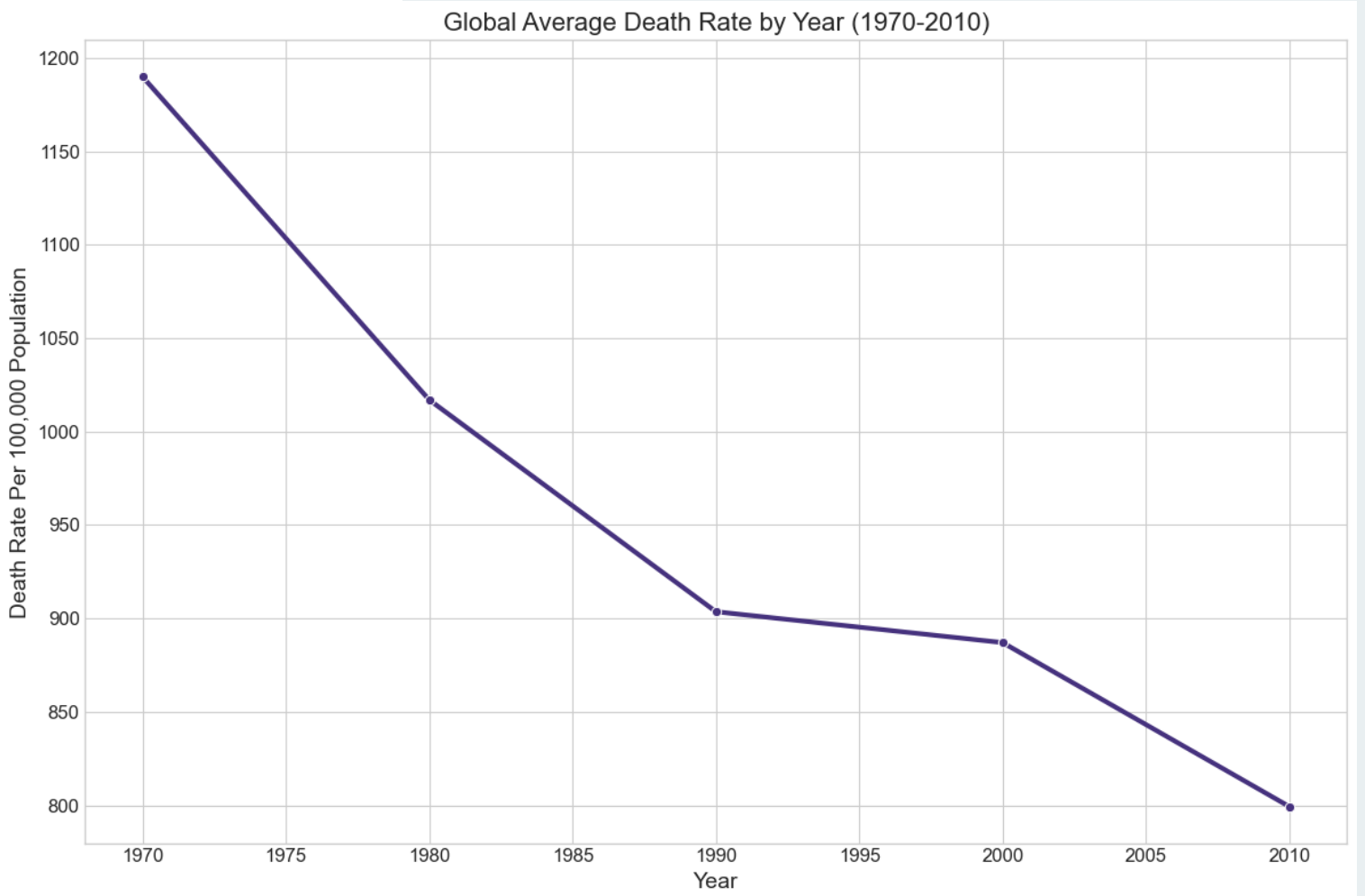
Distribution of deaths over the years

- From 1970 to 2010 there has been a 21.81% increase in global deaths.
- No signs of lesser deaths each progressive year.



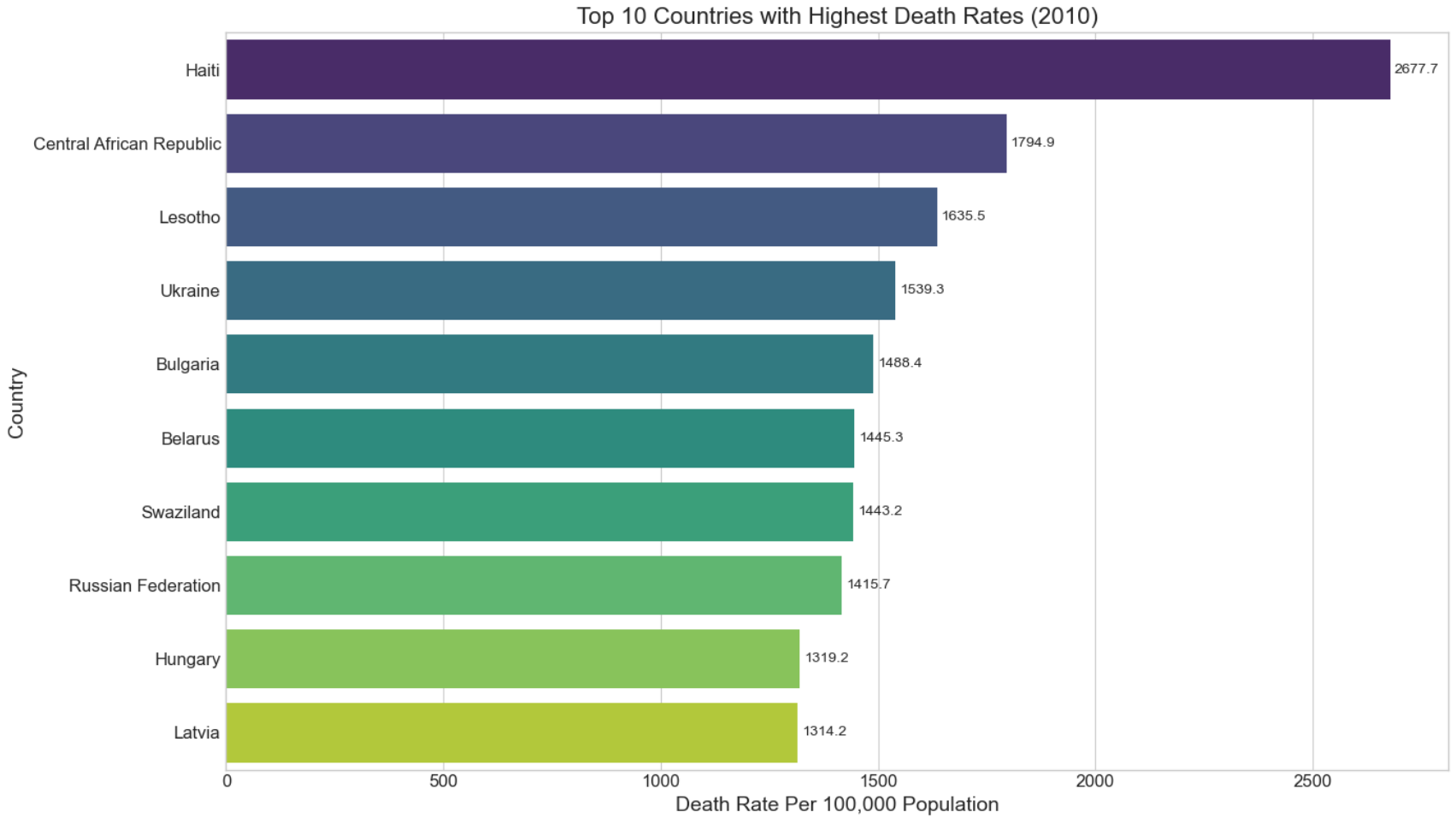
Distribution of deaths over the years

- But the average death rate is gradually getting lower each year.
- This just indicates a higher population despite a higher number of deaths.



Top 10 Countries with Highest Death Rates

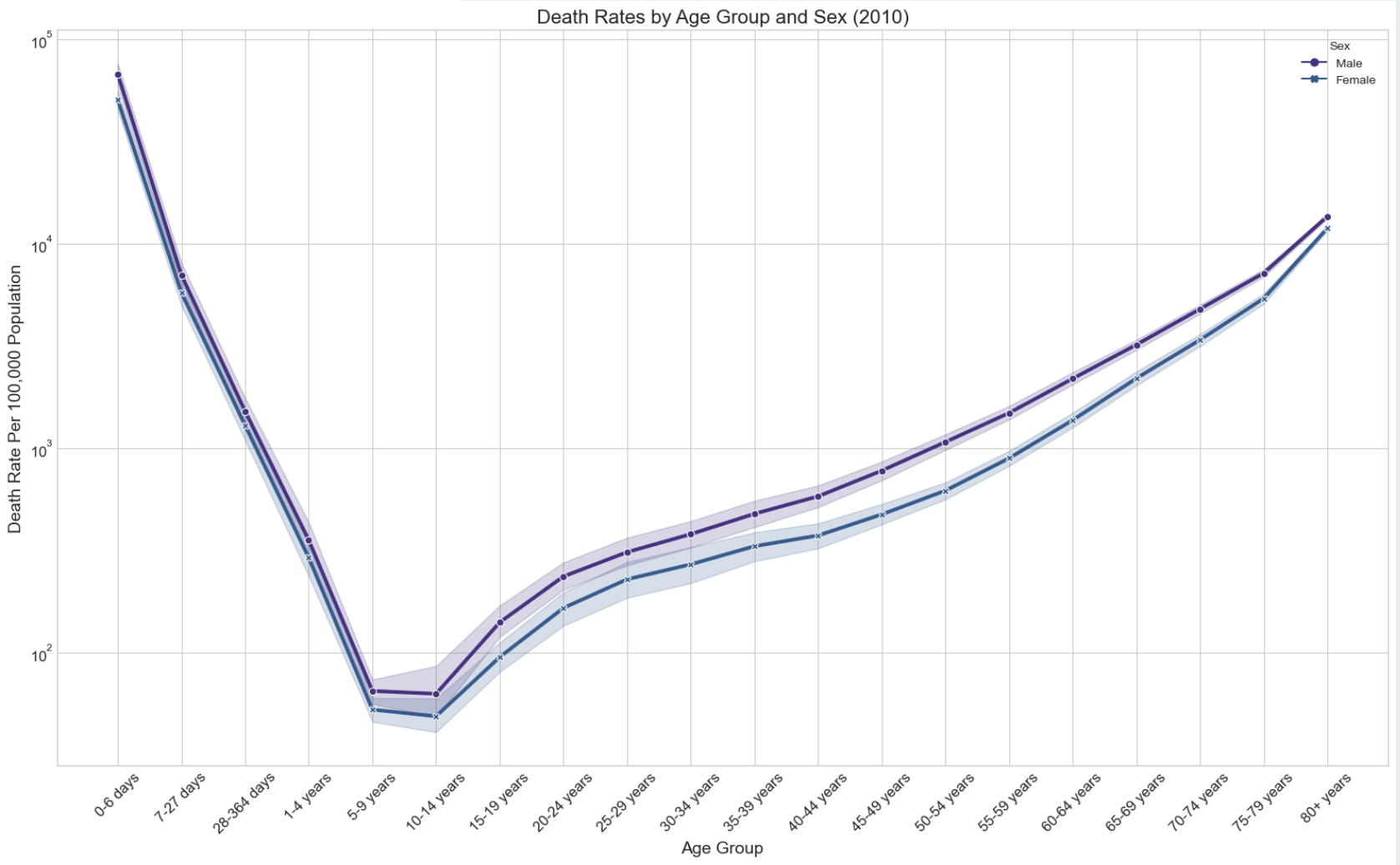
- Haiti is leading with the death rate of 2677.7. Possible due to 2010 earthquake in Haiti and its poverty.
- **Low-income and lower-middle-income countries** (e.g., Haiti, CAR, Lesotho) face mortality due to **infectious diseases and poor health access**.
- **Post-Soviet states and Eastern Europe** struggle with **chronic diseases and socio-economic instability**.



Male to Female Death Rate Ratio by Age Group (2010):

Age Group	Male Rate	Female Rate	M/F Ratio
50-54 years	1070.35	619.20	1.73
55-59 years	1484.37	891.51	1.66
45-49 years	775.18	473.61	1.64
60-64 years	2184.53	1369.46	1.60
40-44 years	580.51	373.60	1.55
15-19 years	140.56	95.07	1.48
65-69 years	3200.13	2191.60	1.46
35-39 years	476.91	331.13	1.44
20-24 years	235.61	165.21	1.43
70-74 years	4783.85	3380.72	1.42
30-34 years	379.33	269.98	1.41
25-29 years	309.80	228.21	1.36
0-6 days	67330.19	50468.99	1.33
75-79 years	7166.82	5388.68	1.33
10-14 years	62.89	48.82	1.29
5-9 years	64.90	52.63	1.23
7-27 days	7007.03	5745.83	1.22
1-4 years	354.99	291.25	1.22
28-364 days	1515.15	1292.28	1.17
80+ years	13579.95	11877.62	1.14

Death Rate by Age Group and Sex

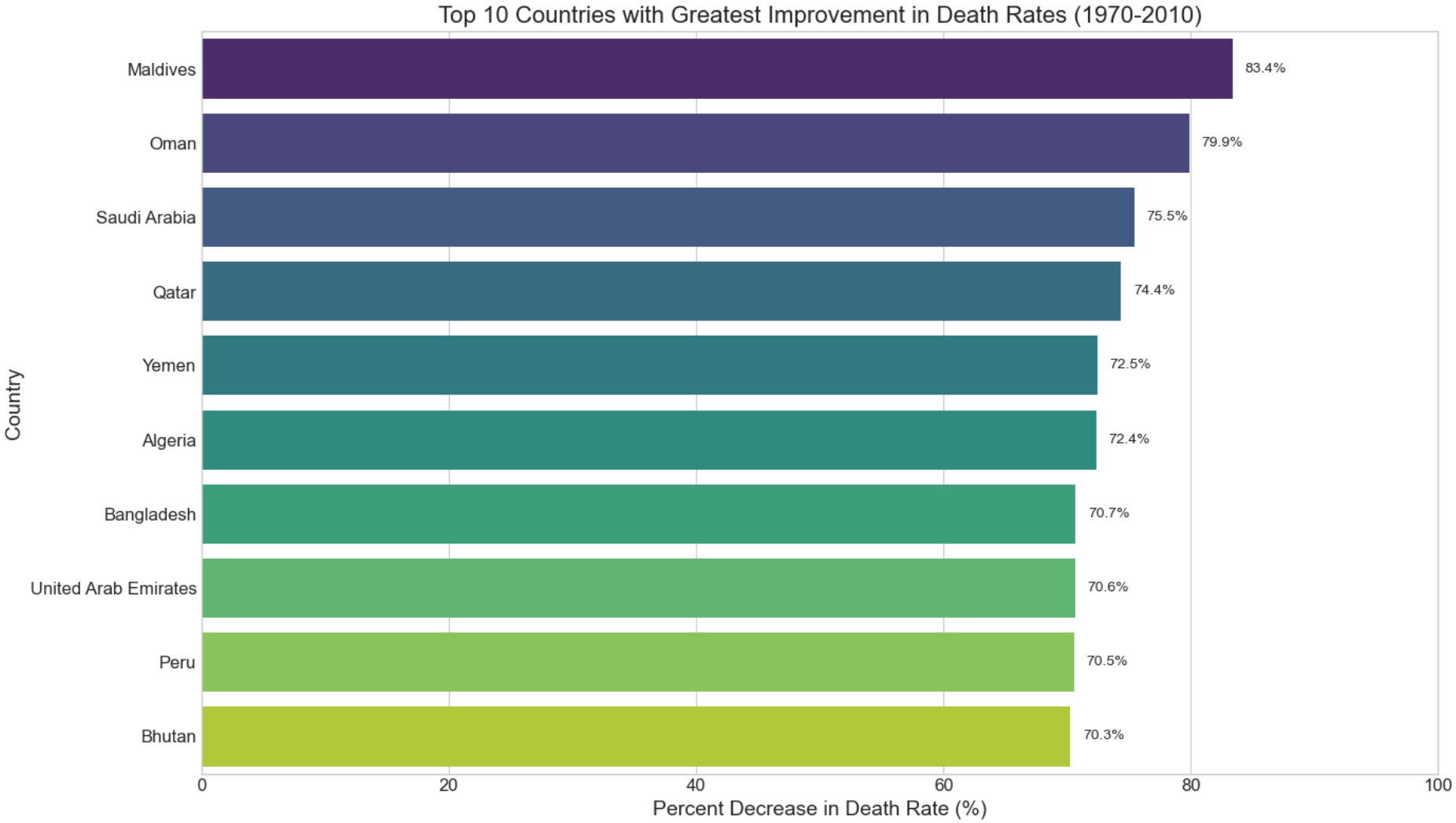


Death Rate by Age Group and Sex

- Males are consistently higher in death rate in every group.
- Highest M/F ratios in 50-54, 55-59 and 45-49 age groups.
- Men in middle age are more prone to diseases and behavioral risk factors like smoking.
- Infant mortality is very high at 67.330 for males and 50.468 for females
- The **gender gap is less extreme** in early childhood and old age but still present.
- These trends emphasize the importance of **targeted health interventions** for men, especially in middle age and adolescence.

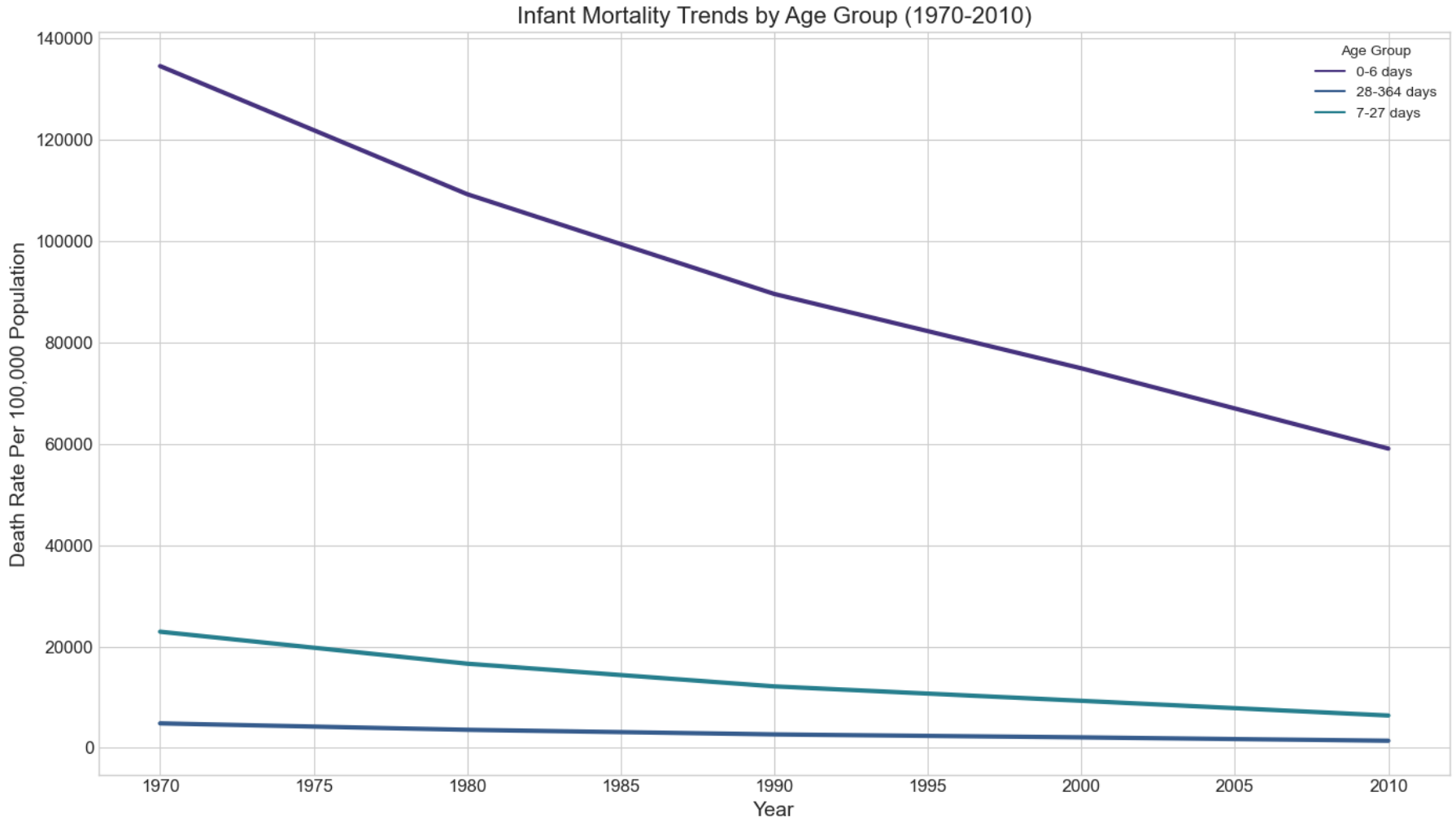
Countries with Biggest Improvement in Death Rates (1970-2010)

- Maldives has the largest reduction at 83.4% reflecting its significant improvements in healthcare and economy.
- Gulf countries rapid economic development due to oil wealth to gain access to healthcare and etc.



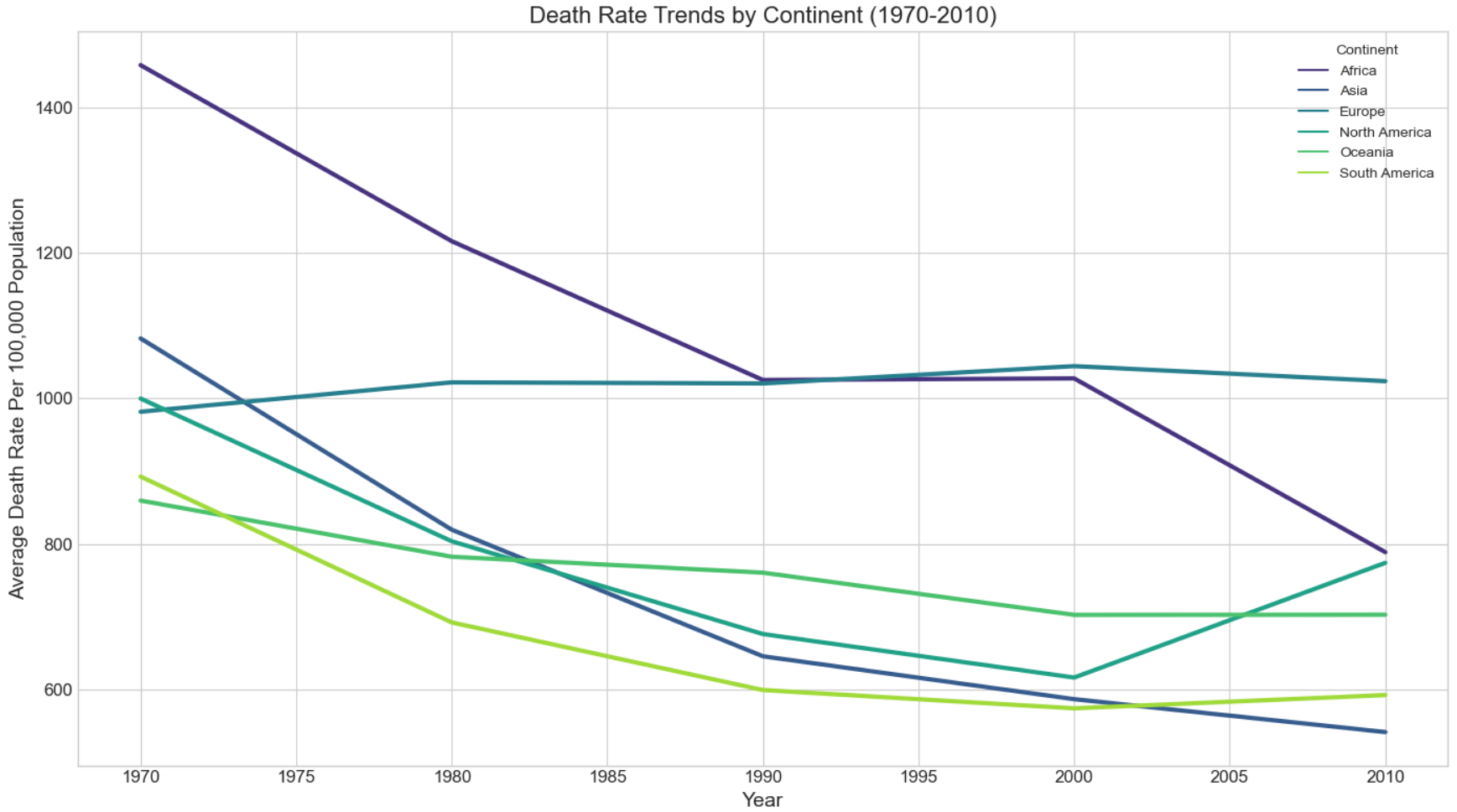
Age Group Analysis: Death Rate Trends Over Time

- This trend is due to the rapid development of technology and widespread adoption of better healthcare and access to it.
- Leading to infants having a lesser death rate in the progressive years.



Regional Analysis: Death Rates Across Continents

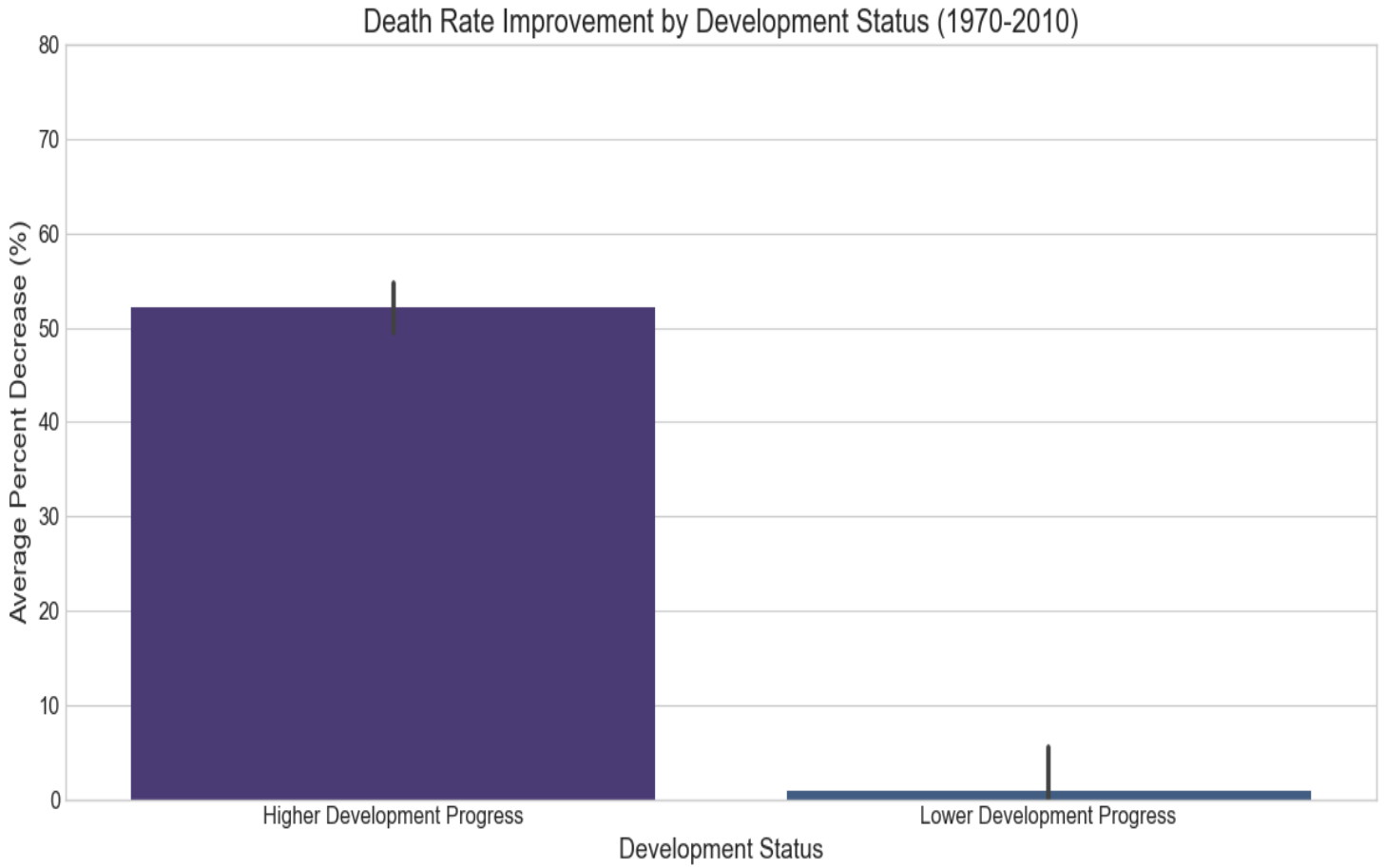
- Africa has the highest death rate due to its insufficient healthcare access and economy.
- While America and Oceania are seeing progressive improvement over the years, Europe remains level at around 1000.



Final Analysis: Mortality Trends by Development Status

- Countries with higher development reduced mortality by 52% compared to 1% in lower progress
- Rapid developing economies showed the greatest health improvements.

Development Status	Rate 1970	Rate 2010	Percent Decrease
Higher Development Progress	1439.45	677.38	52.25
Lower Development Progress	937.70	922.69	0.88



Key findings and insights

Global Mortality Trends

- **Key Findings:**
- Deaths rose from 43.2M to 52.6M globally
- Death **rate** fell by 30–40%
- Population growth outpaced mortality improvements

- **Recommendations:**
- Strengthen scalable healthcare systems
- Prepare for aging populations
- Customize interventions by population segments

High-Mortality Hotspots (2010)

- **Key Findings:**
- Highest death rates: Haiti, Central African Republic, Lesotho
- Eastern Europe (e.g., Ukraine, Bulgaria) shows unexpectedly high mortality
- Over 3 SD above global norms

- **Recommendations:**
- Direct aid to high-mortality countries
- Address root causes in Eastern Europe (e.g., CVD, alcohol, suicide)
- Build emergency health systems in crisis regions

Age & Sex Mortality Patterns

- **Key Findings:**
- **Infant mortality** (0–6 days) disproportionately high
- **Males** face 15–30% higher mortality, especially ages 15–29
- "Bathtub curve" pattern: high in infancy, dips, rises with age

- **Recommendations:**
- Improve neonatal care and access
- Launch young men's health initiatives
- Design interventions aligned with life stage risk profiles

Most Improved Countries

- **Key Findings:**
- Maldives: 83.4% mortality reduction
- Middle East/North Africa (e.g., Oman, Saudi Arabia) saw major gains
- Linked to health reforms + economic growth

- **Recommendations:**
- Benchmark top-performing countries
- Fast-track health system modernization
- Link infrastructure upgrades to economic plans

Infant Mortality Transformation

- **Key Findings:**
- Overall infant mortality down significantly
- **Slower improvements** in 0–6 day mortality
- Neonatal progress leads to broader health gains

- **Recommendations:**
- Ensure skilled birth attendance universally
- Expand neonatal ICU access
- Use mobile tech for maternal care

Regional Disparities & Convergence

- **Key Findings:**
- Africa: high mortality, but improving
- Europe: plateaued in many areas
- Asia: most dramatic improvement

- **Recommendations:**
- Launch regional health partnerships
- Revive progress in Eastern Europe
- Apply Asian models to African development contexts

Development Status & Mortality Reduction

- **Key Findings:**
- High-progress countries: 52% mortality reduction
- Low-progress countries: 1% reduction
- 1970 death rates were similar meaning **development strategy matters**

- **Recommendations:**
- Integrate health + economic planning
- Tailor strategies to each country’s development stage
- Use data to target causes of mortality

Final conclusion

Actionable insights:

– Prioritize early-life & male health interventions

– Adapt proven models from top performers

– Create region- and development-specific strategies

– Integrate health with economic development

– Use data to drive continuous policy refinement

Thank you

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