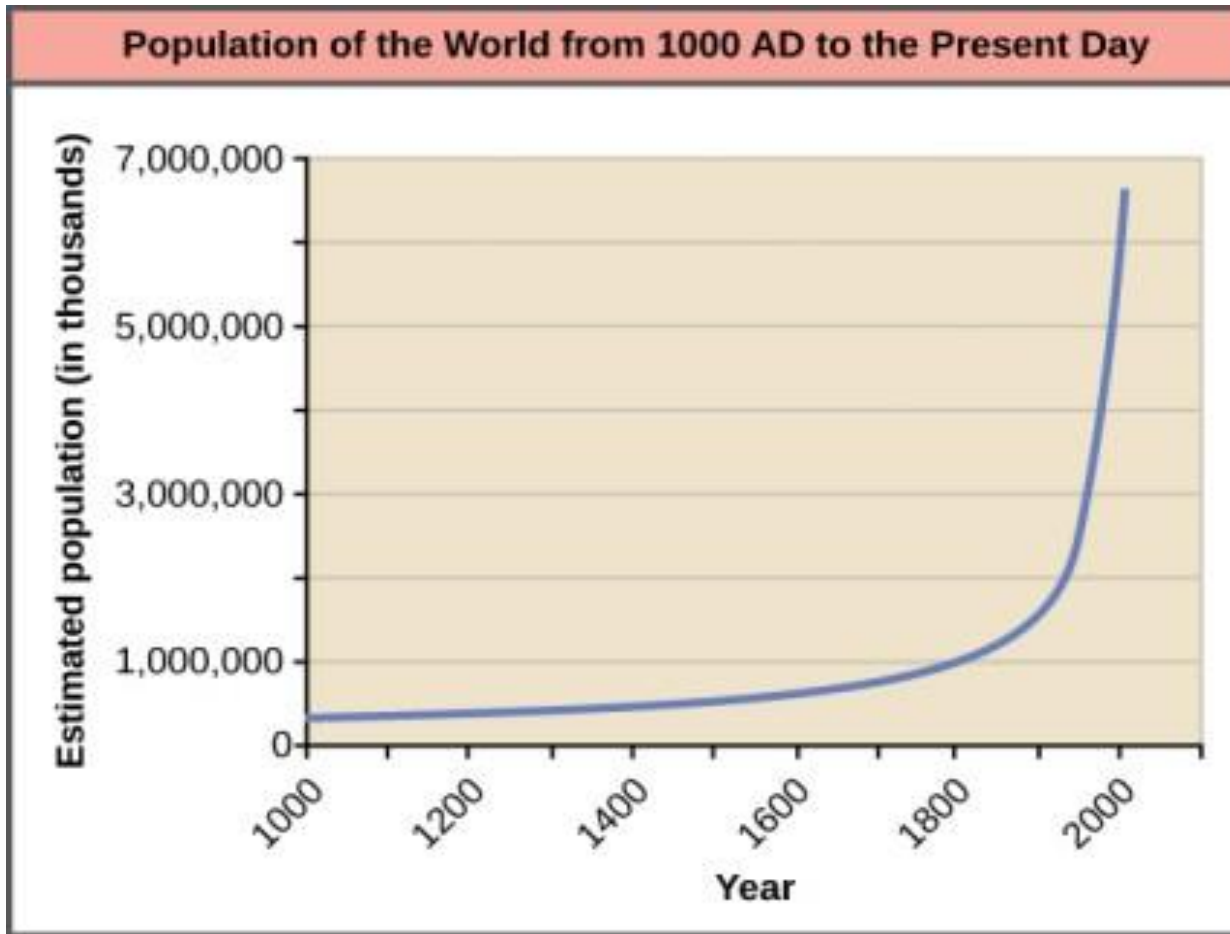


A high-angle, wide shot of a massive, dense crowd of people, filling the entire frame. The individuals are packed closely together, creating a colorful mosaic of clothing and skin tones. The crowd appears to be gathered for a significant event, possibly a festival or a large-scale public gathering. The text 'Human Population & Ecological Footprint' is superimposed in the center of the image in a large, white, sans-serif font. The background shows a flat, open area, possibly a field or a large plaza, with some distant structures visible on the horizon.

Human Population & Ecological Footprint

The technological advances that followed the **Industrial Revolution** enabled an exponential rise in the human population.

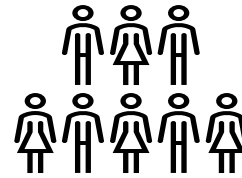
This has raised concerns over the Earth's carrying capacity for sustaining our quality of life.



From “Environmental Issues” by Andrew Frank

<https://pressbooks.bccampus.ca/environmentalissues/front-matter/introduction/>

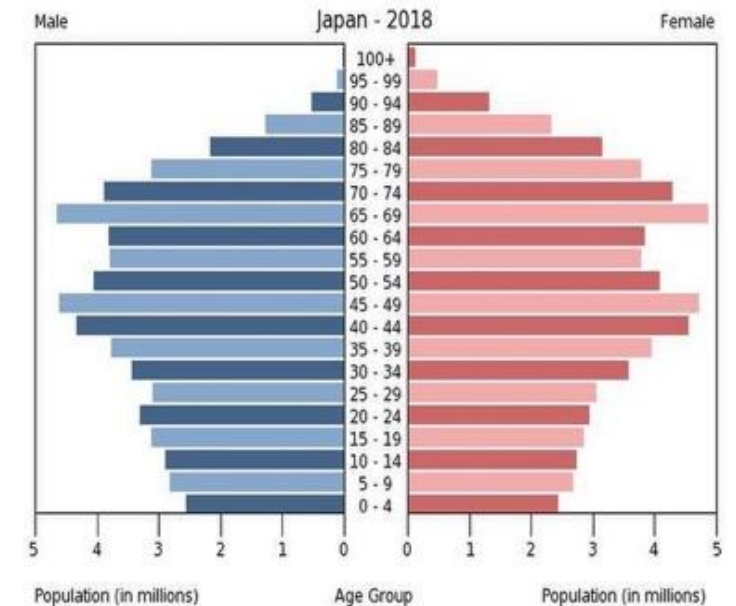
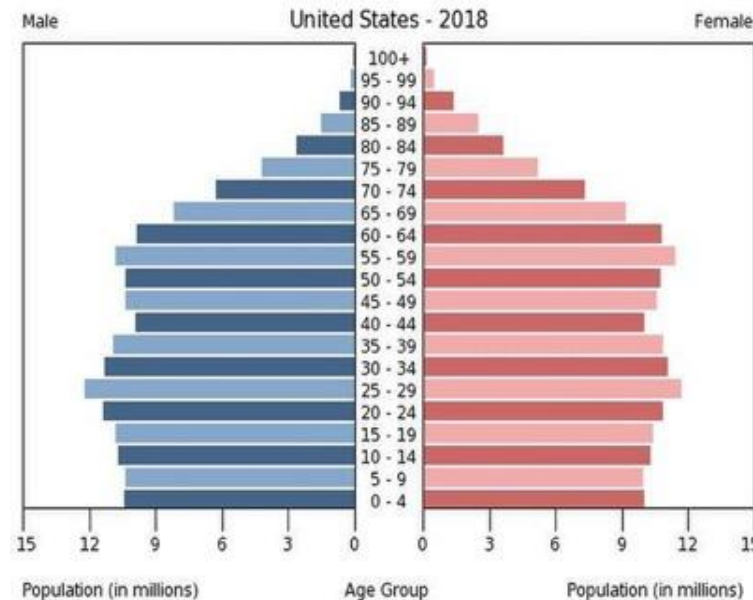
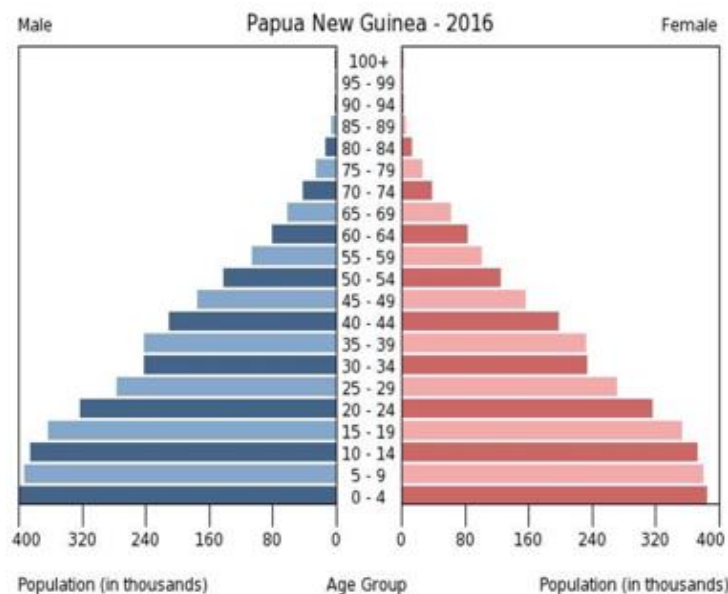
Today, growth rates differ by nation:



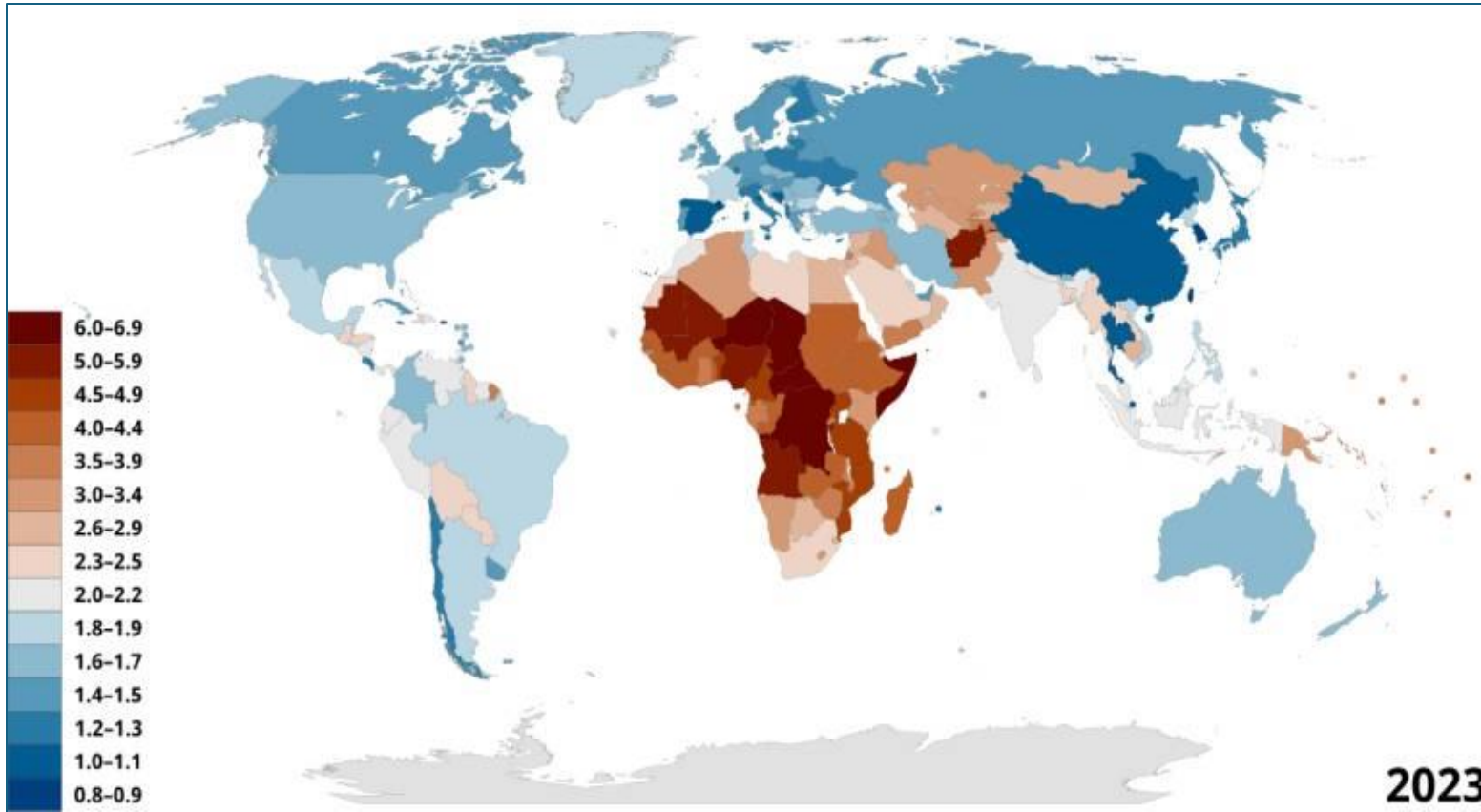
In **Papua New Guinea**, population is **growing rapidly** because children make up the largest portion of this **demographic pyramid**.

In the **United States**, the population is **growing slowly** because number of small children is roughly equivalent to that of reproductive-aged adults.

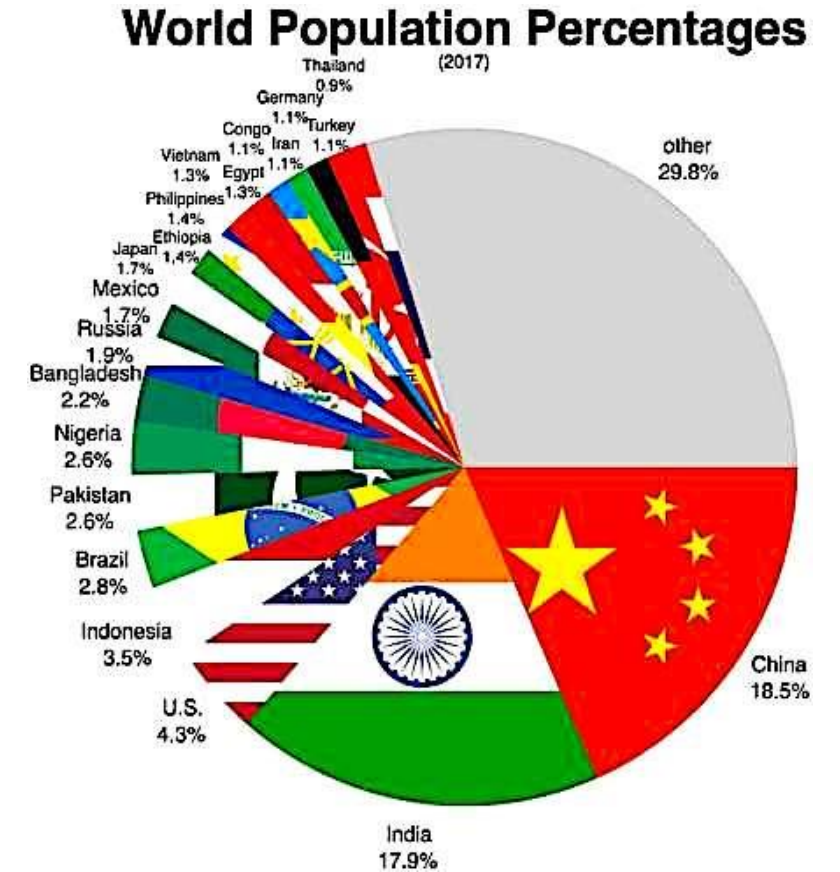
In **Japan**, the population is **declining** because the number of reproductive-aged adults far exceeds that of the small children.



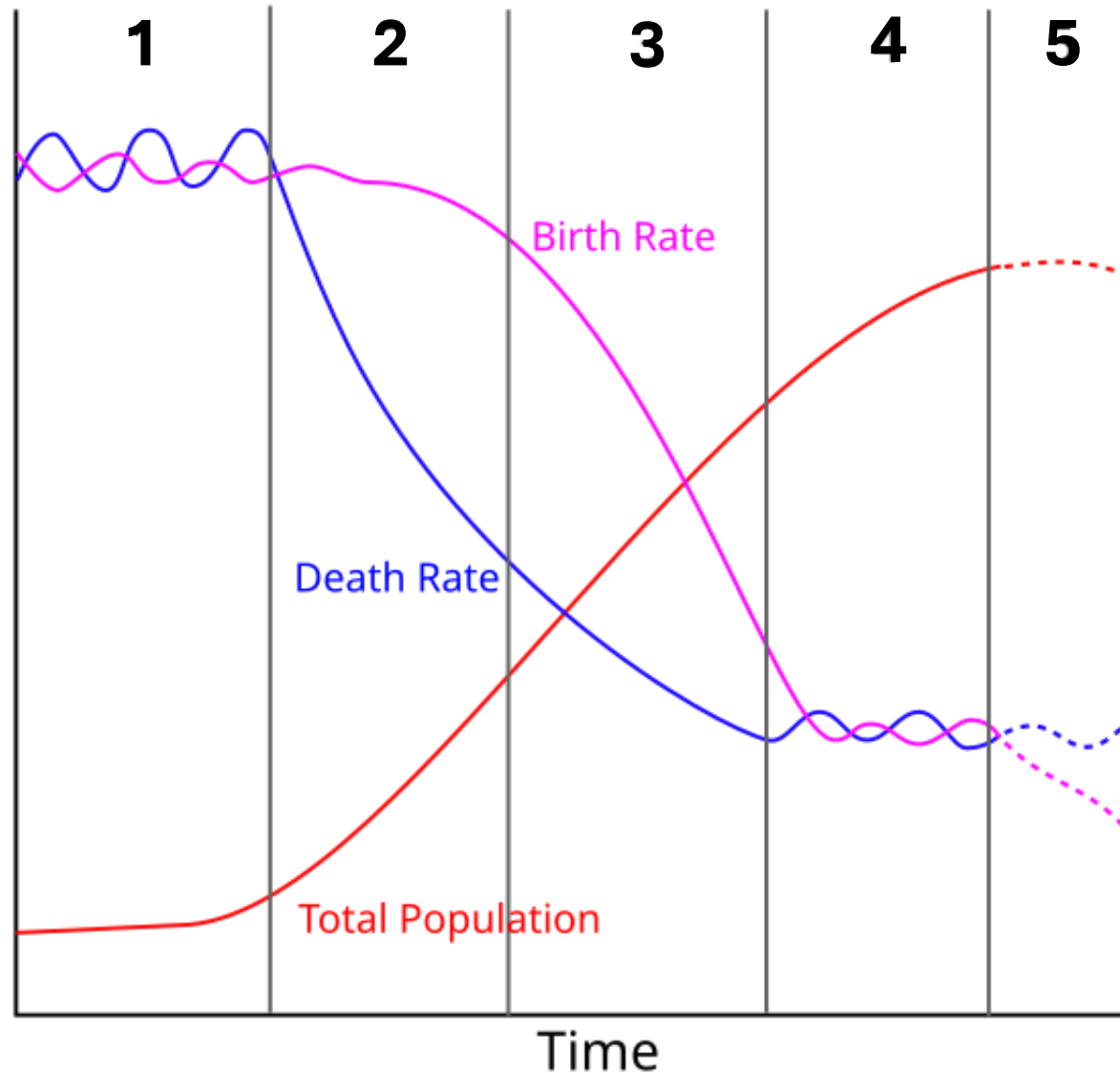
Population growth is fastest in Africa and portions of Central Asia, but about a third of the world's population lives in China and India.



Map provided by the Population Reference Bureau: <https://2022-wpds.prb.org/>



The **demographic transition model** shows how human population growth goes through five stages:



Stage 1: Both birth and death rates are high, and there is no net growth. This was the main pattern during pre-industrial times.

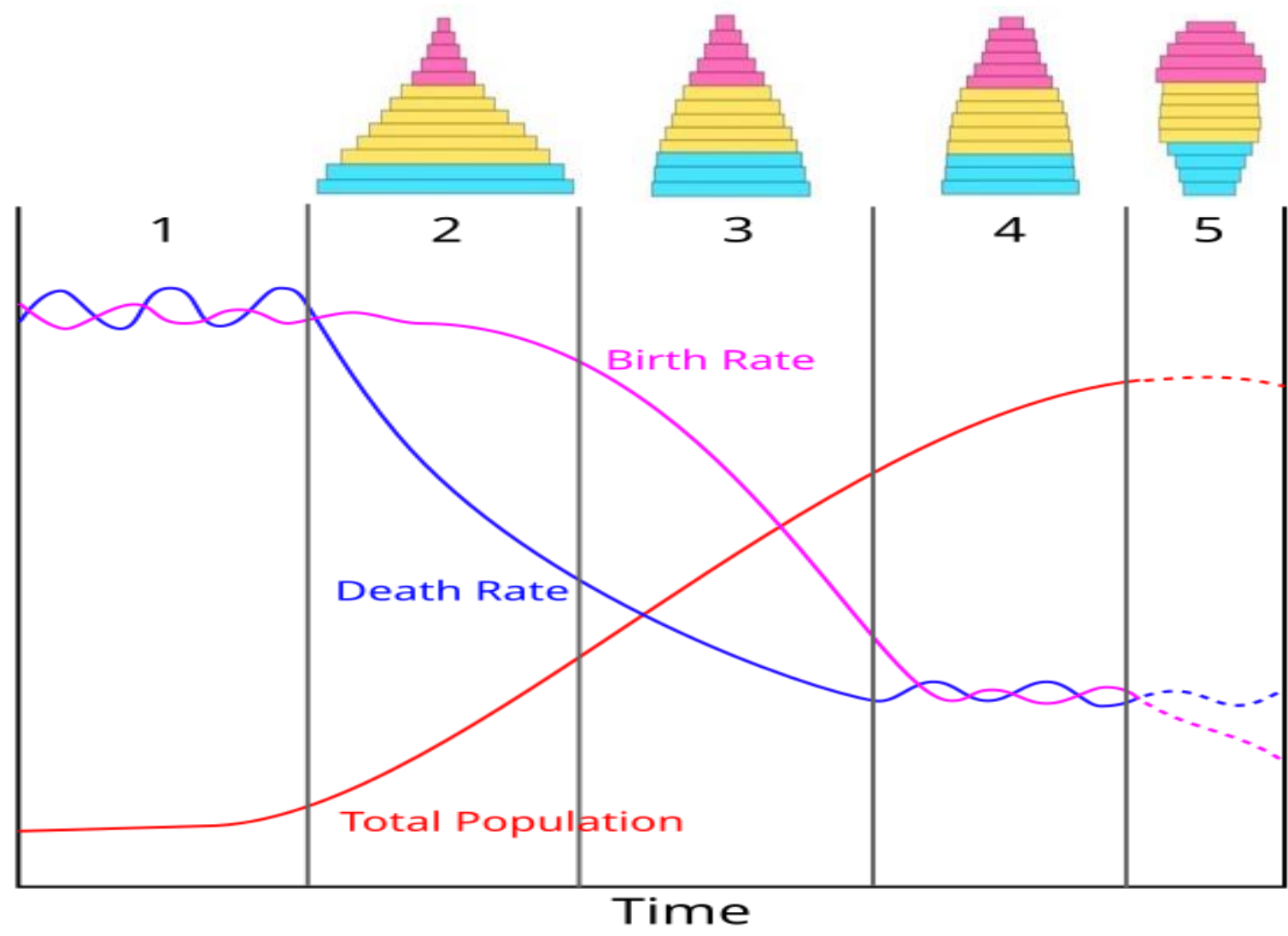
Stage 2: The population is growing at its fastest rate due to rapidly declining death rates.

Stage 3: Both birth and death rates are declining, but the population continues to grow because birth rates continue to exceed death rates.

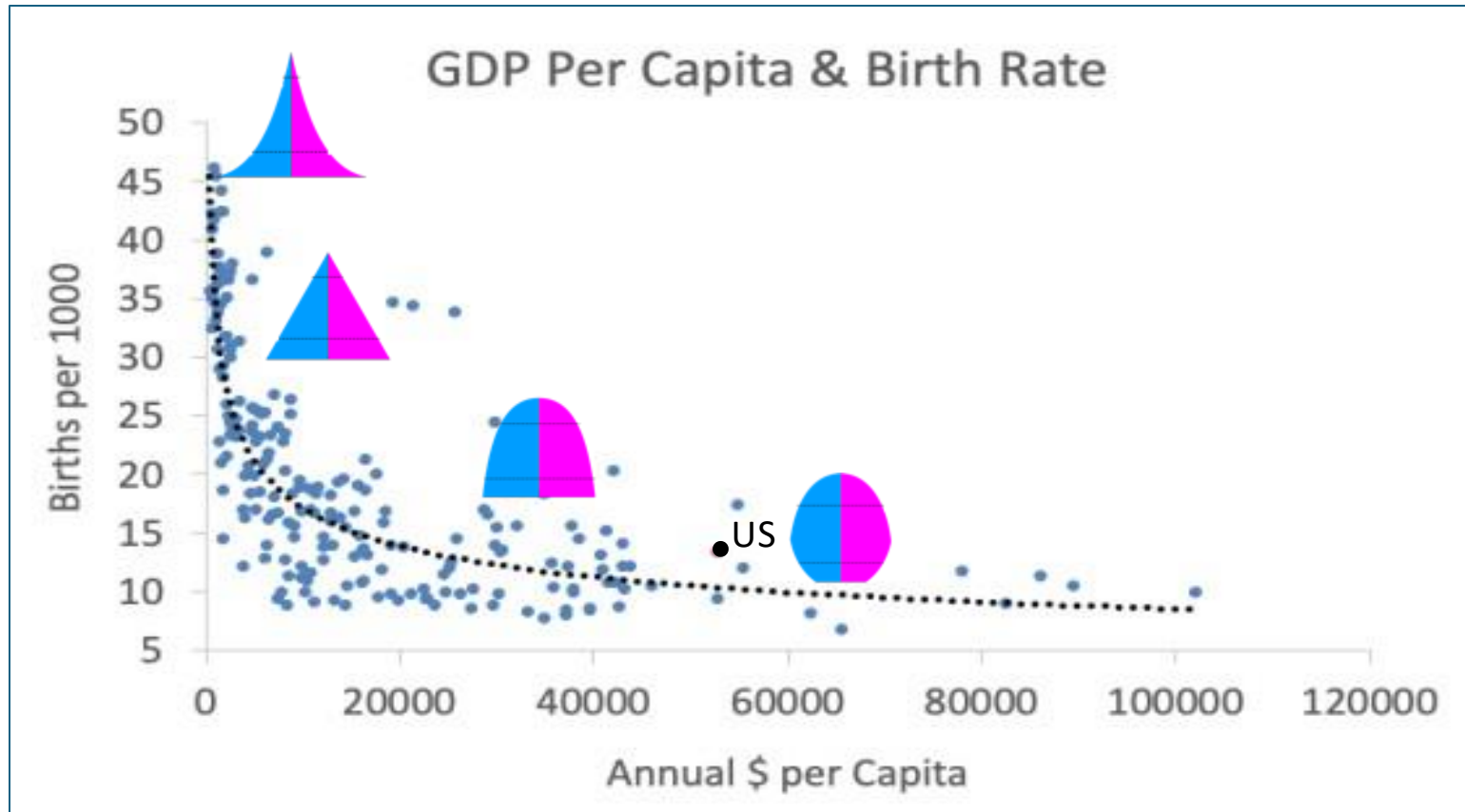
Stage 4: Population growth slows down as birth rates decline to the same level as death rates.

Stage 5: Population levels start to decline as birth rates decline below death rates.

These demographic pyramids correspond to portions 2-5 of the demographic transition model.



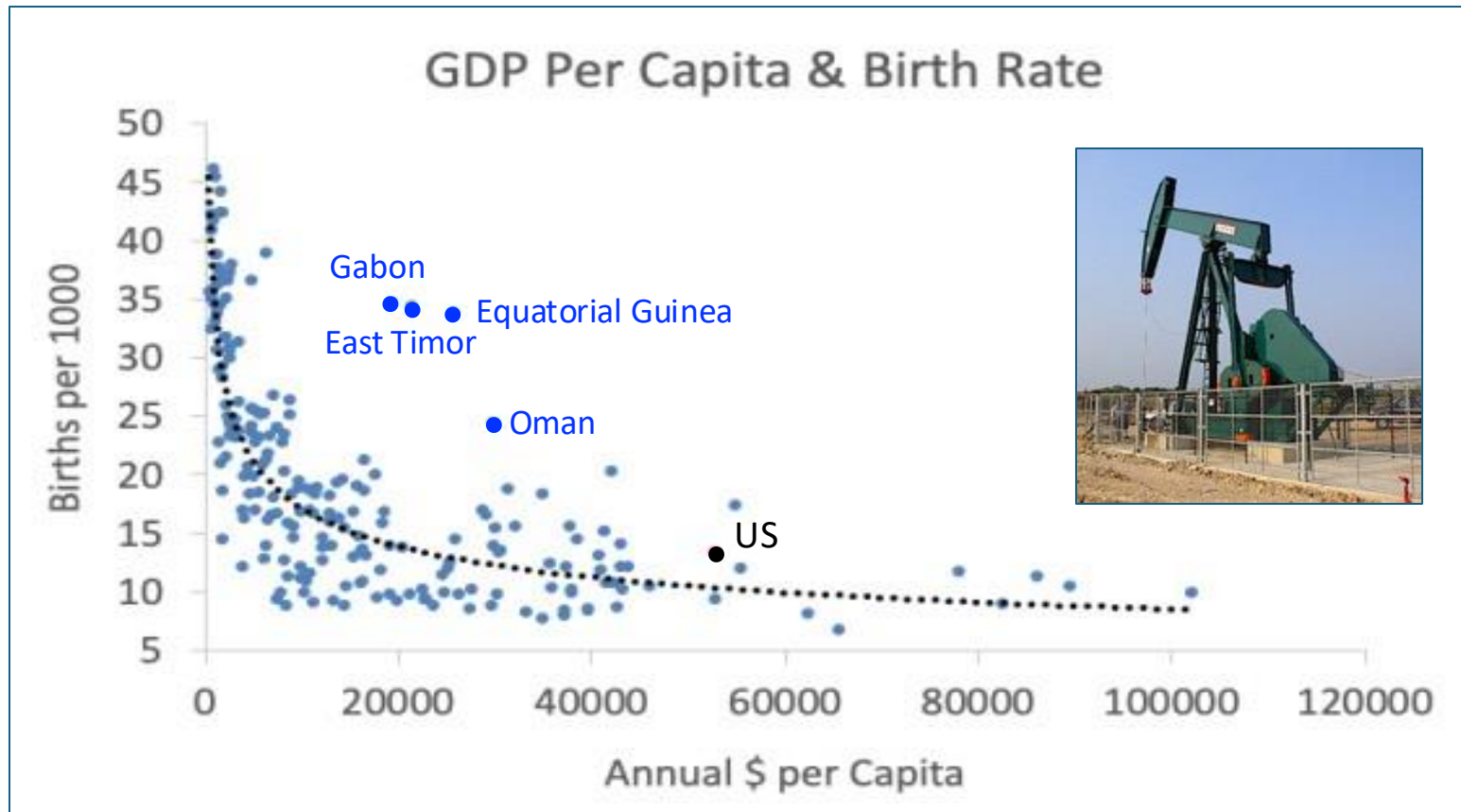
The pyramids are also indicators the societal changes that accompany development. This is why poor nations that rely more on agriculture have faster growing populations.



Source: CIA Factbook (data from 2012-2015). Each point represents a nation.

These nations (in blue) are outliers because nearly all their wealth is from recently discovered oil deposits.

Their birth rates are still high because despite high GDP, they did not experience the cultural transitions that normally occur during industrialization.



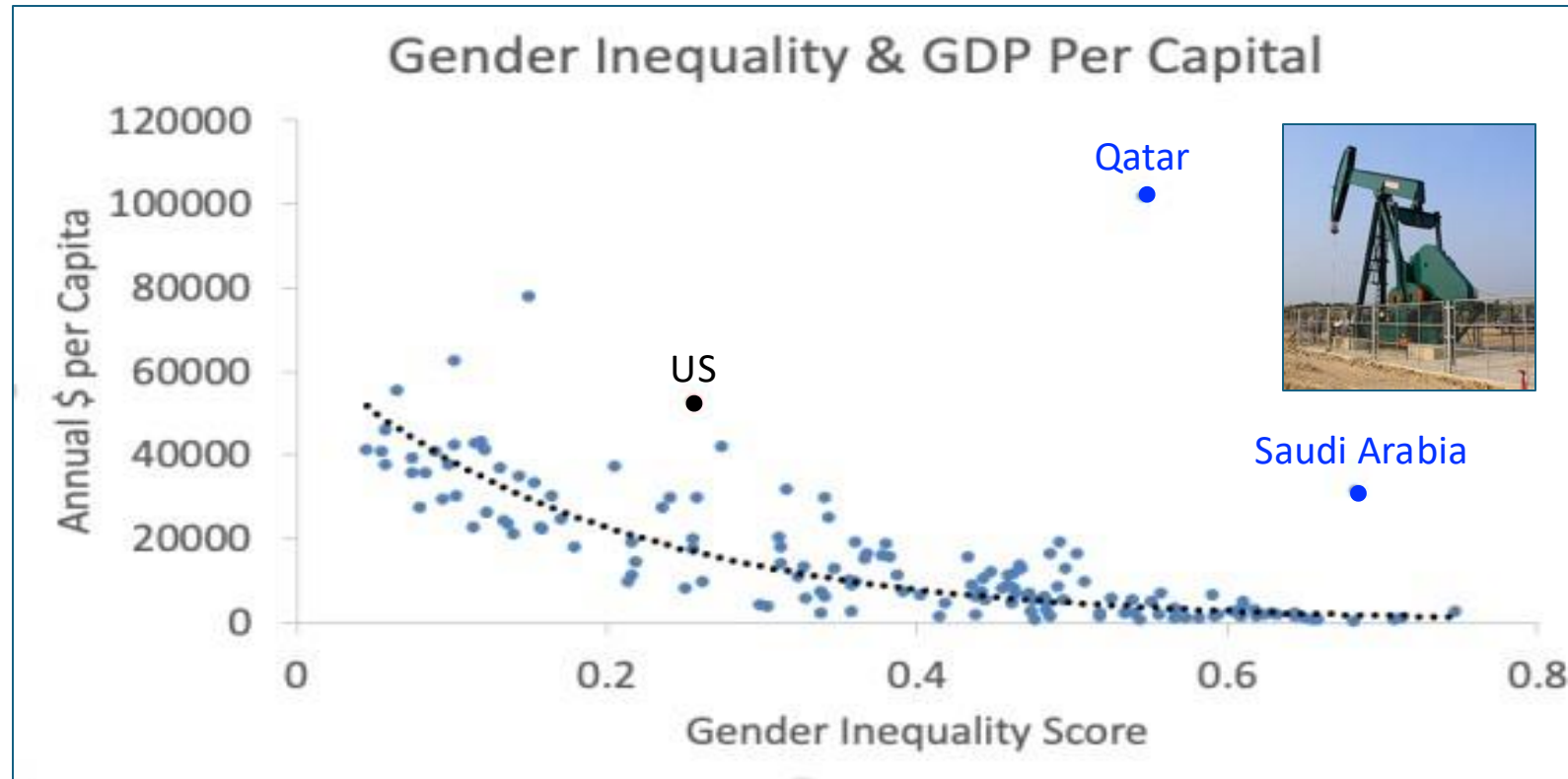
Source: CIA Factbook (data from 2012-2015). Each point represents a nation.

One of these cultural changes is female empowerment.
This is why gender inequality is correlated with high birth rates.



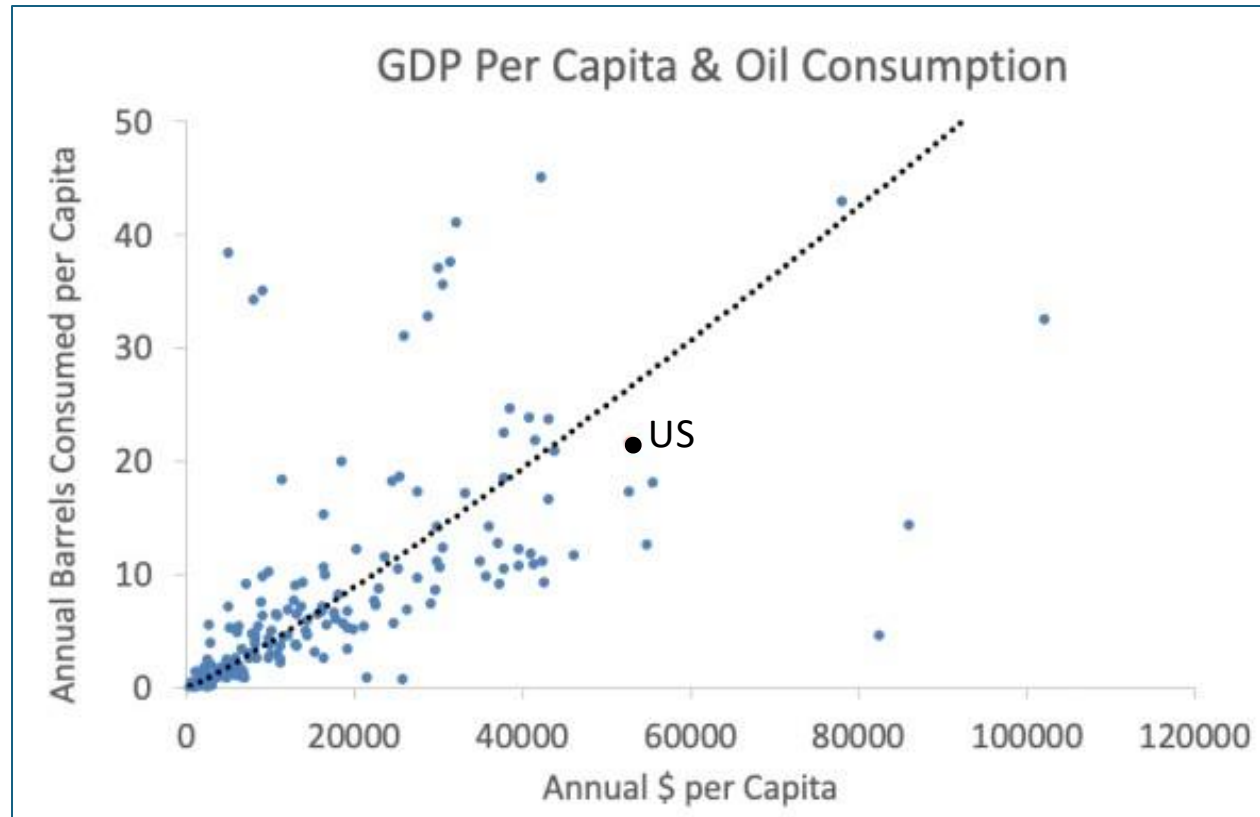
Sources: CIA Factbook (data from 2012-2015) and UN Human Development Programme Reports (2012).
Each point represents a nation.

Unsurprisingly, most nations with less gender equality also have a lower per capita GDP. These nations (in blue) are outliers because nearly all their wealth comes from oil exports.



Sources: CIA Factbook (data from 2012-2015) and UN Human Development Programme Reports (2012). Each point represents a nation.

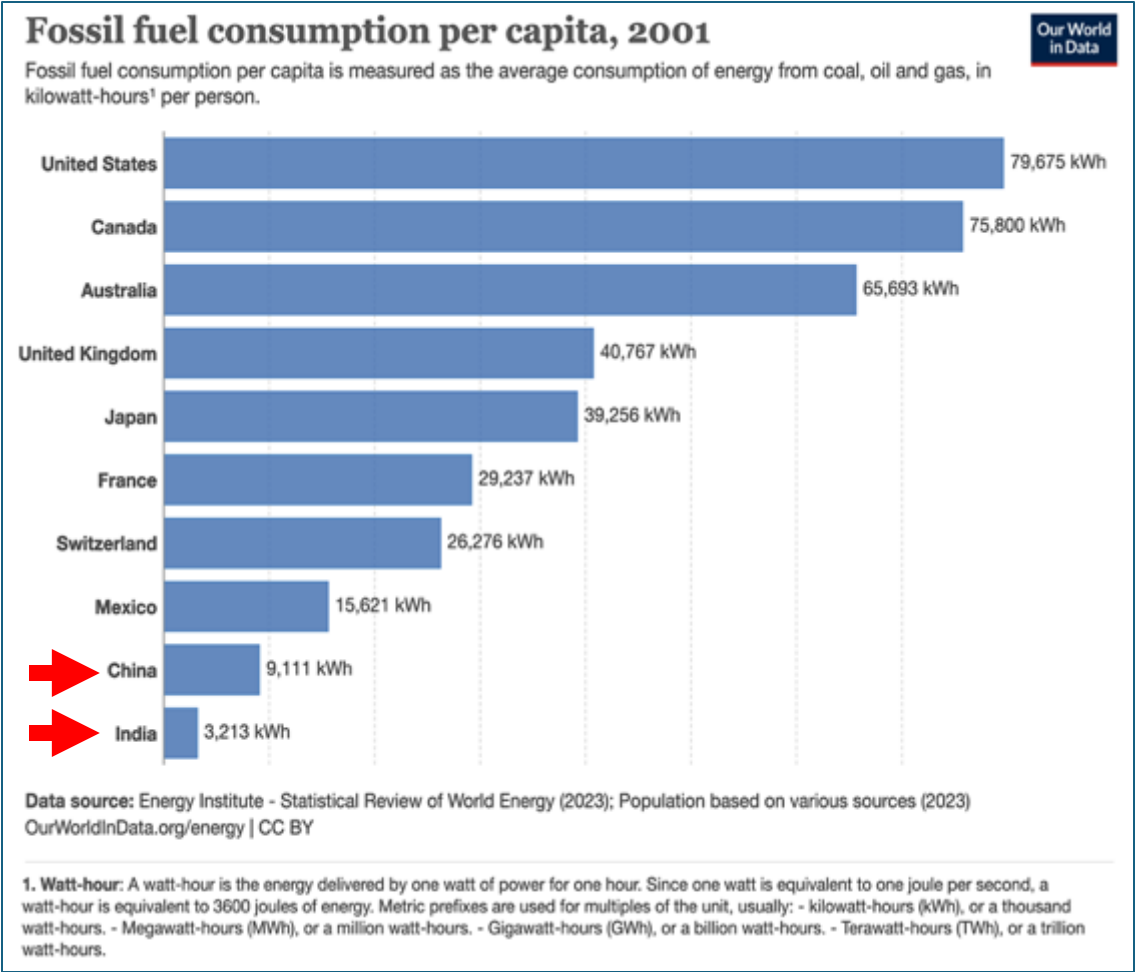
Population growth is not the only driver of growing environmental pressures:
Affluent nations usually consume more fossil fuels per capita...



Source: CIA Factbook (data from 2012-2015). Each point represents a nation. To minimize statistical artifact, this graph excluded five nations that serve as fueling depots for passing ships.

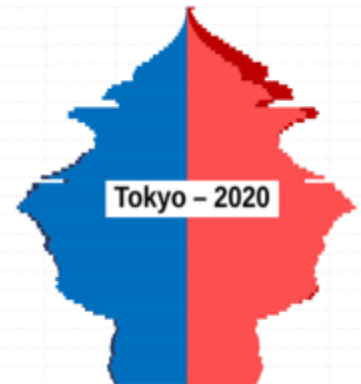
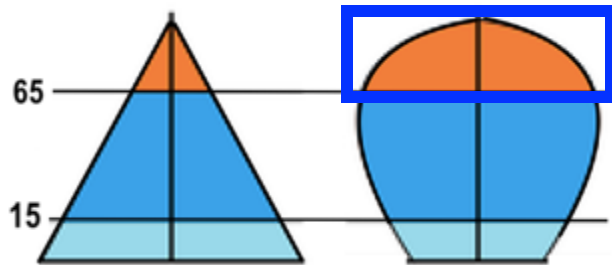
...and Americans use significantly more resources than Western Europeans with comparable standards of living.

Further strains on the environment are anticipated as heavily populated nations like China and India grow their economies.



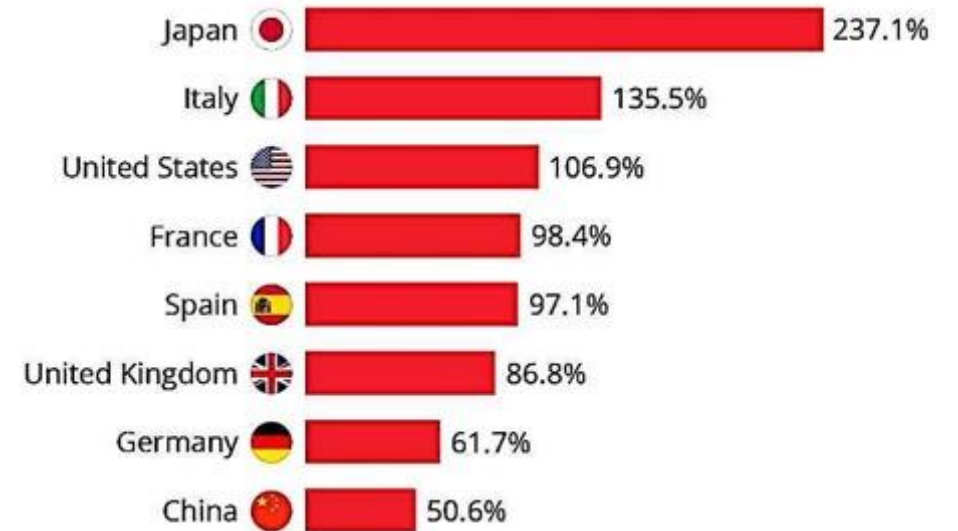
Declining population may ease pressures on the environment, but it can incur economic hardships: Nations with **falling birth rates** struggle to finance the **increasing number of retirees** that outlive their contributions to social security.

Longer life spans and declining fertility are now the main drivers of the **debt crisis** in Japan and Italy.



Next Stop: Debt Crisis?

General government debt as a percentage of GDP in 2018* (selected countries)



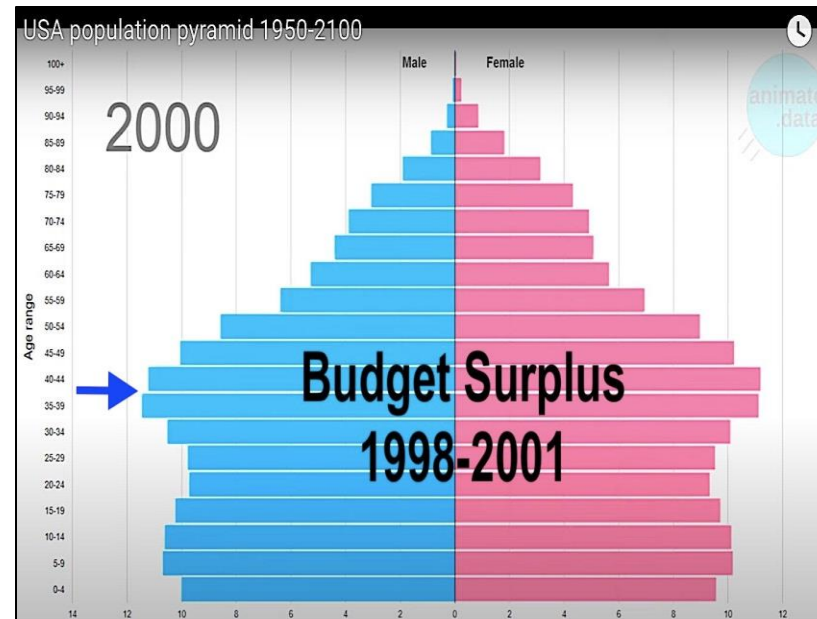
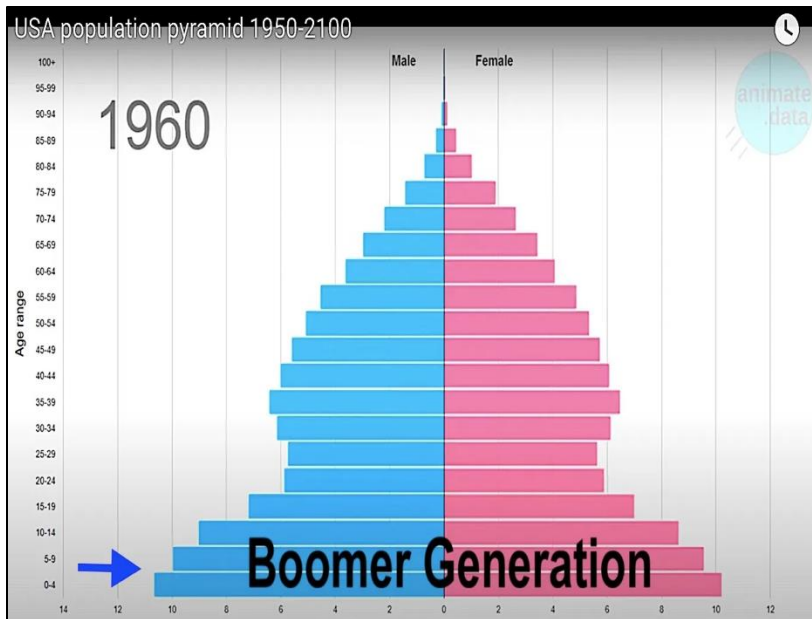
* total stock of debt liabilities issued by the general government as a share of GDP
Source: IMF



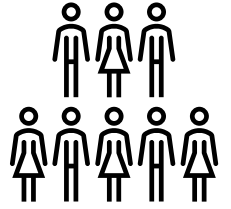
The term “boomer” refers to Americans born during the “baby boom” that happened after the end of World War II (1946 to 1964).

The budget surplus of 1998-2001 was largely driven by a critical mass of working Americans contributing record amounts of tax revenue. This is when these boomers were in their prime.

Ironically the same boomers that helped balance the budget may end up bankrupting social security after large numbers of them retire.



Tentative Solutions for Addressing Ongoing Challenges of Human Population:



- Empower women in less affluent nations.
- Minimize environmental impact in affluent nations through green technologies and best practices.
- Implement a retirement age that takes longer life expectancies into account.
- Facilitate the preservation of extended families to minimize societal costs of aging populations.



Acknowledgement:



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