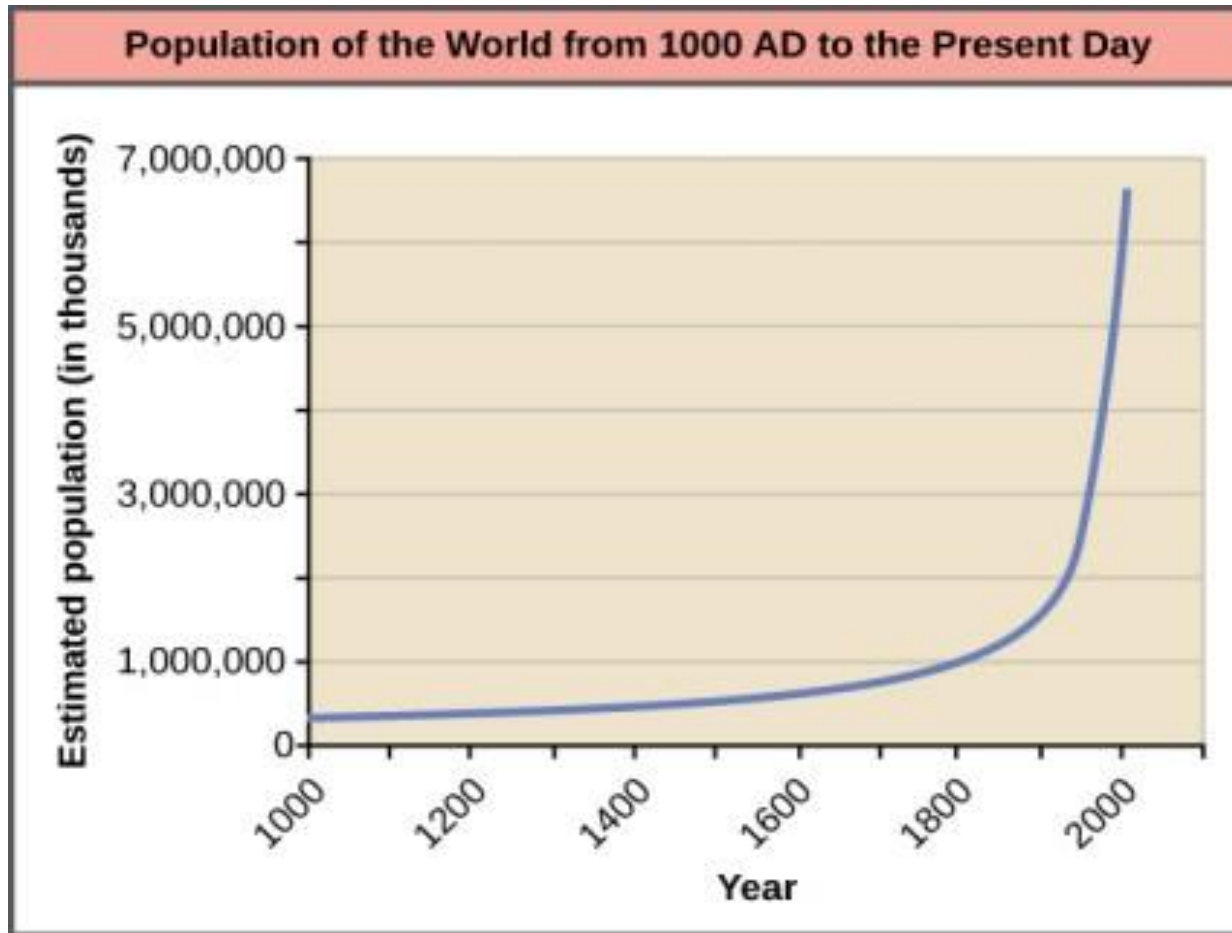


A large, dense crowd of people, likely at a market or festival, with the text "Human Population & Ecological Footprint" overlaid in white. The crowd is diverse in age and attire, with many people wearing colorful clothing. The background is a vast expanse of people stretching towards the horizon.

# Human Population & Ecological Footprint

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

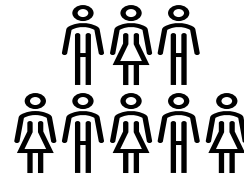
This has raised concerns over the Earth's carrying capacity for sustaining our quality of life.



From "Environmental Issues" by Andrew Frank

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

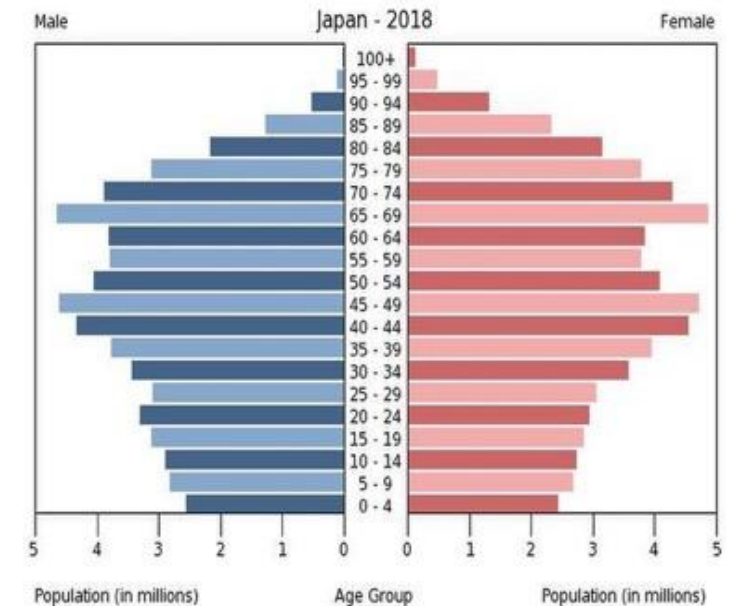
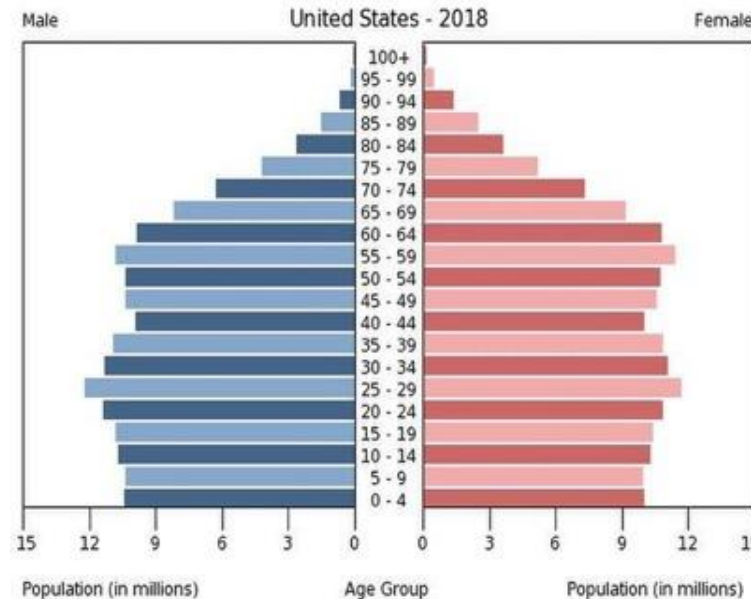
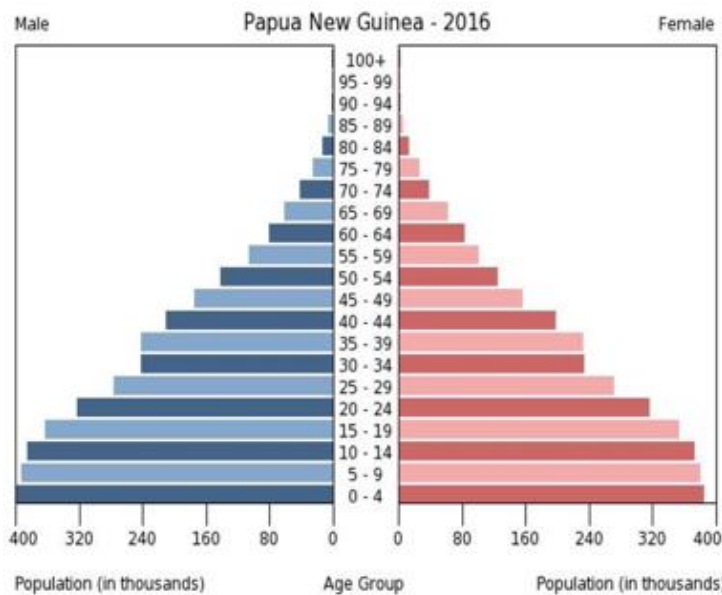
Today, growth rates differ by nation:



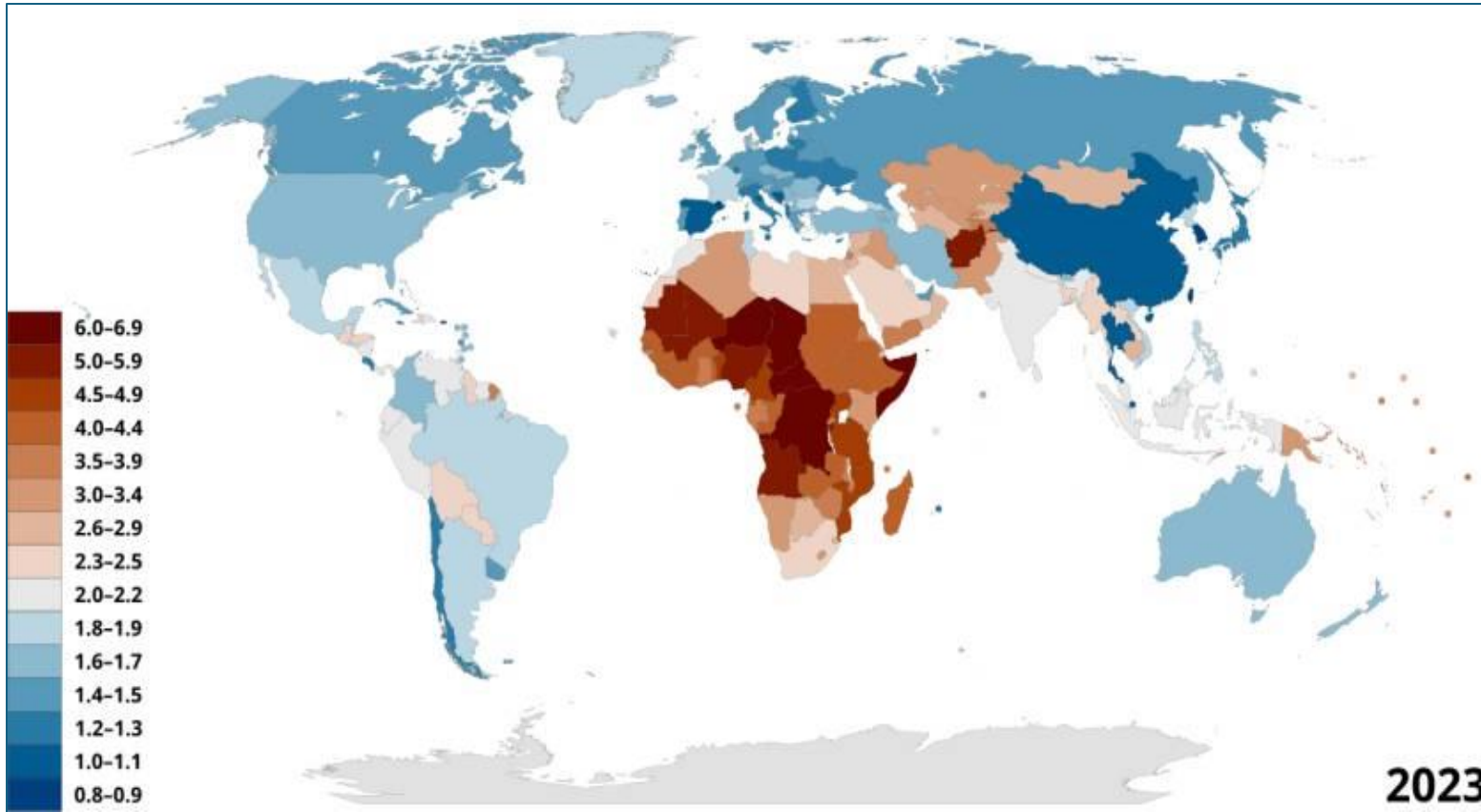
In **Papua New Guinea**, population is **growing rapidly** because children make up the largest portion of this **demographic pyramid**.

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

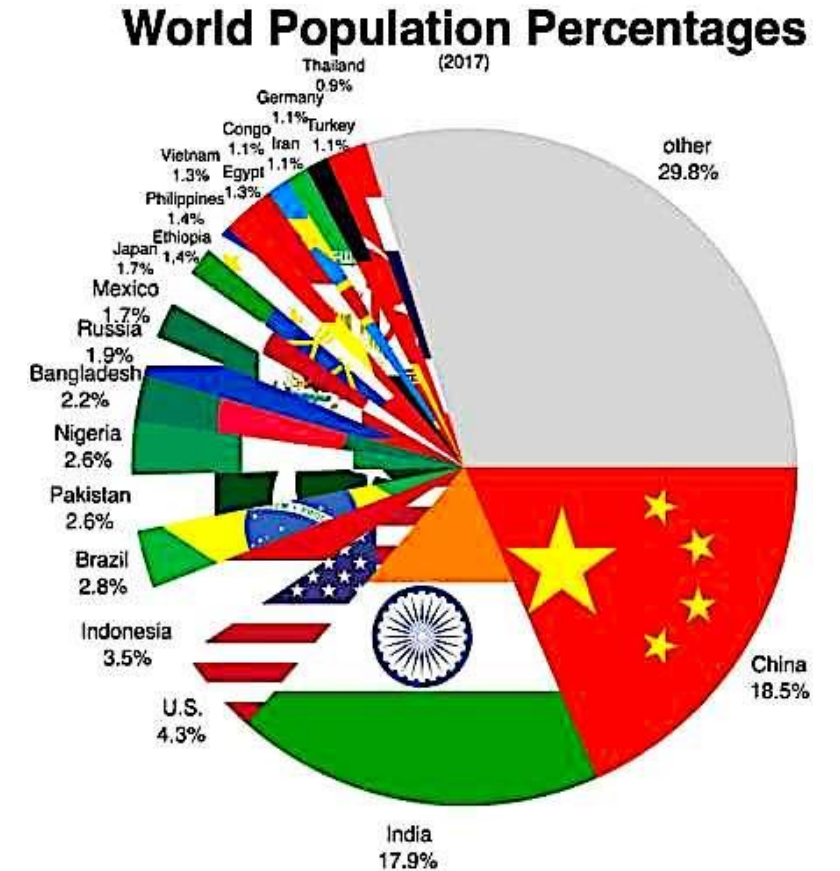
In **Japan**, the population is **declining** because the number of reproductive-aged adults far exceeds that of the small children.



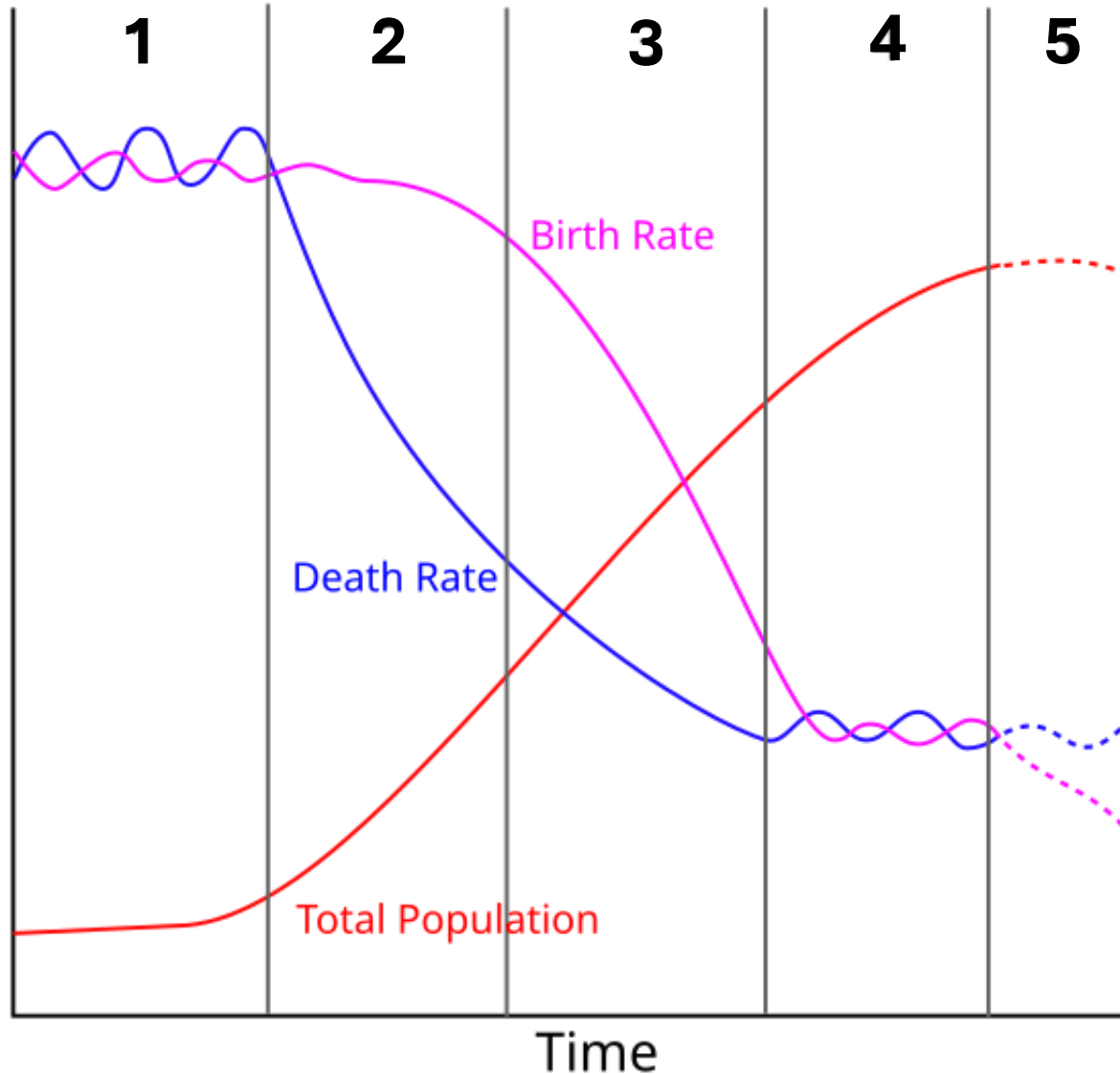
Population growth is fastest in Africa and portions of Central Asia, but about a third of the world's population lives in China and India.



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.

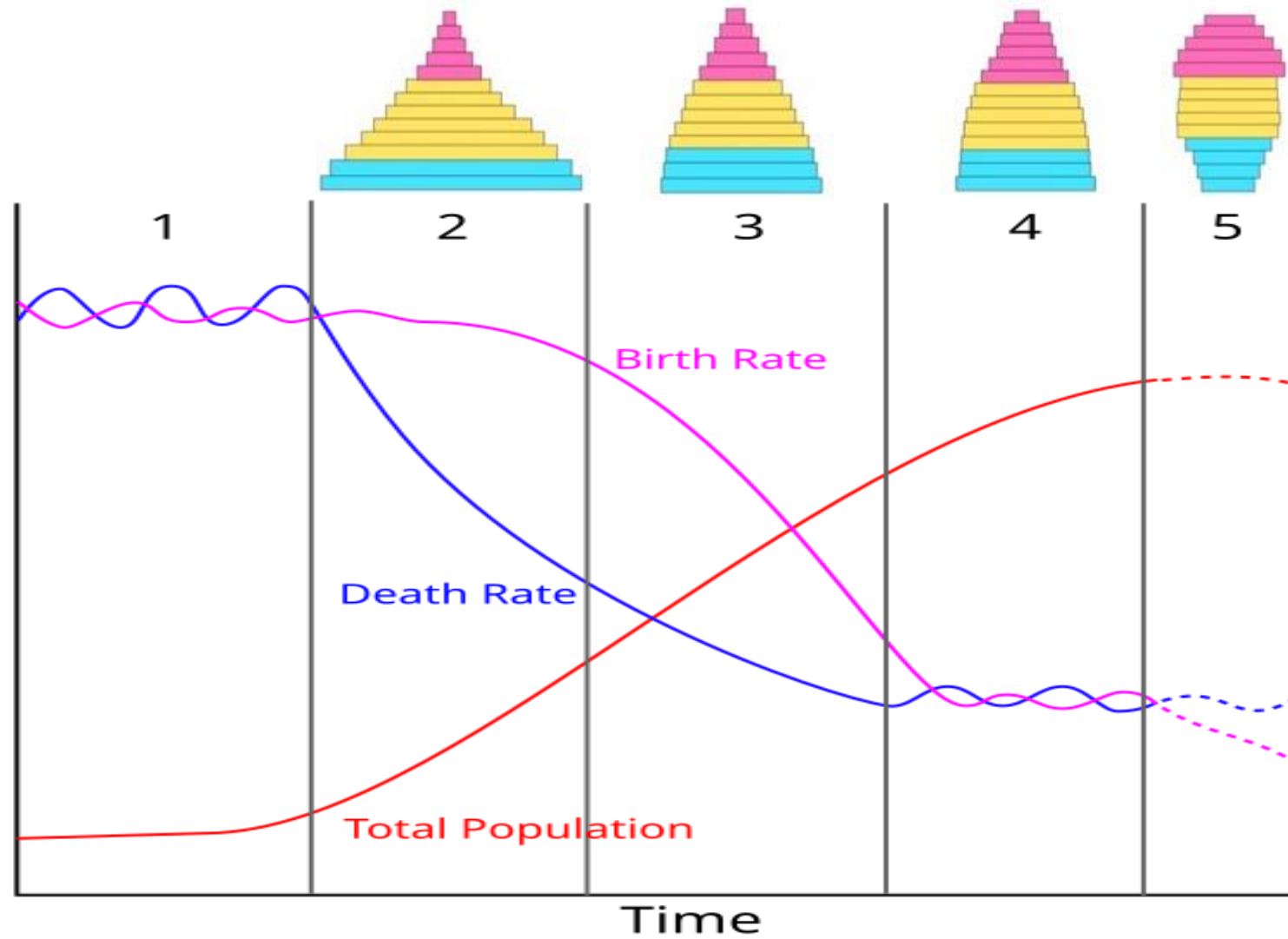
**Stage 2:** The population is growing at its fastest rate due to rapidly declining death rates.

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

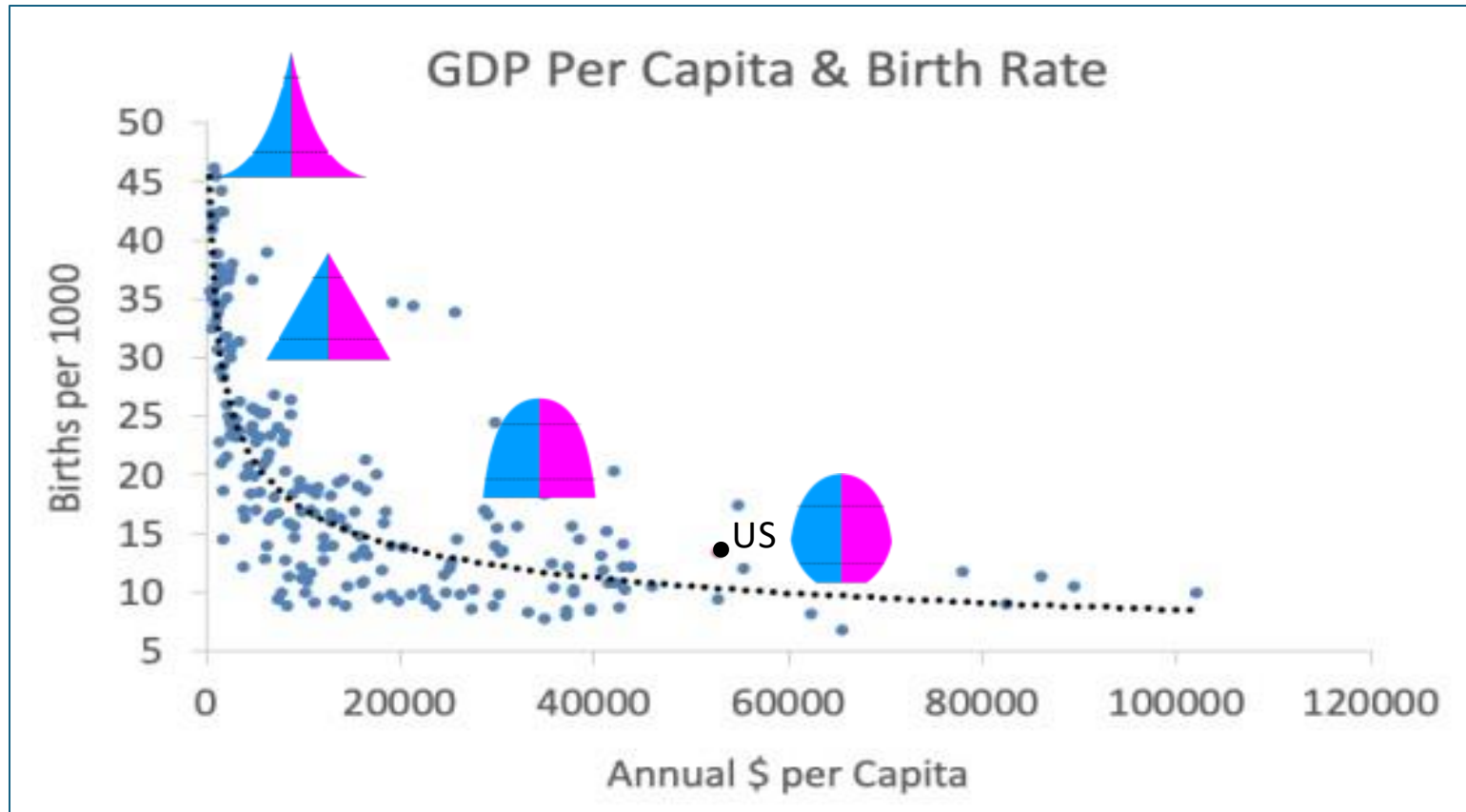
**Stage 4:** Population growth slows down as birth rates decline to the same level as death rates.

**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.



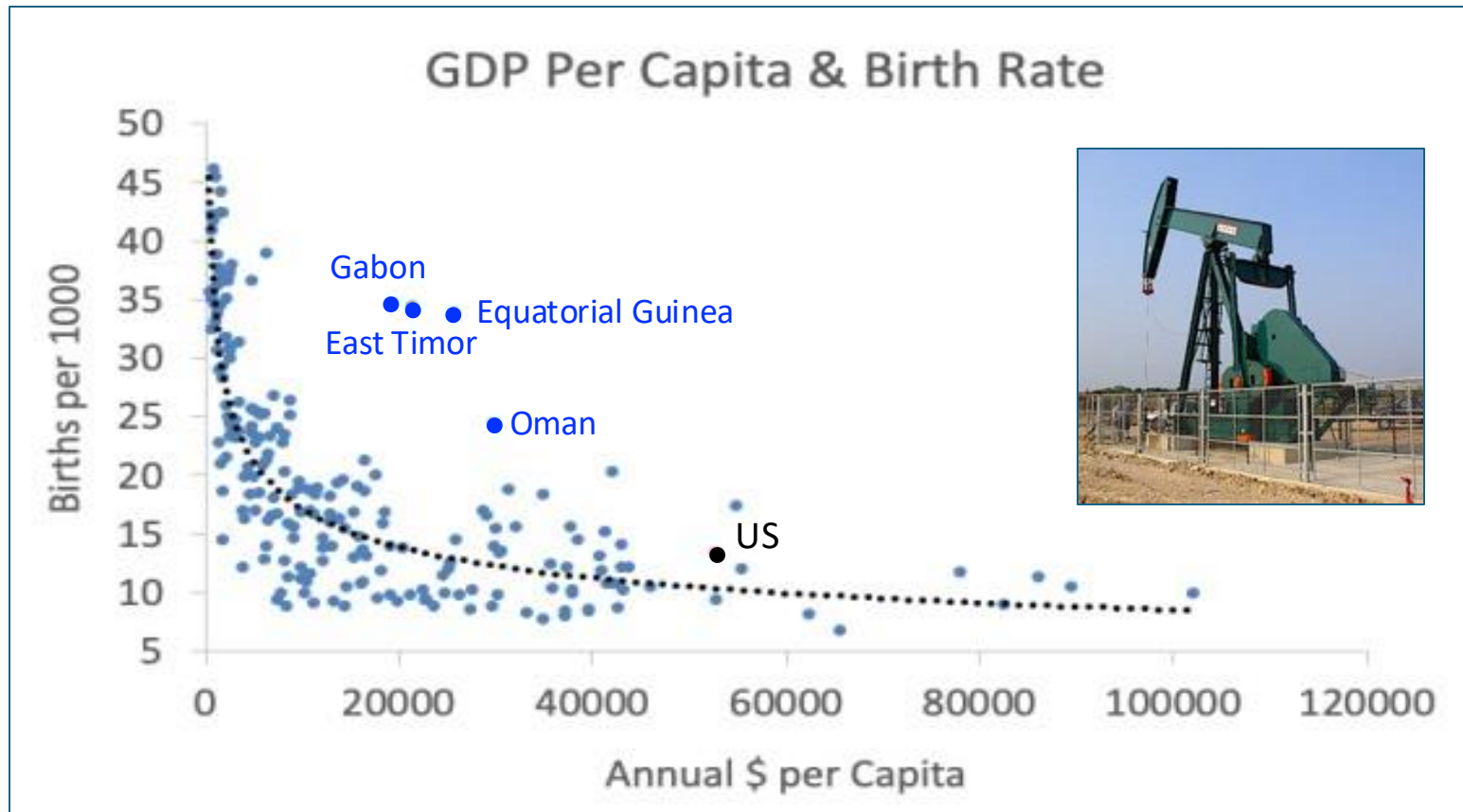
The pyramids are also indicators the societal changes that accompany development. This is why poor nations that rely more on agriculture have faster growing populations.



Sources: 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.



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

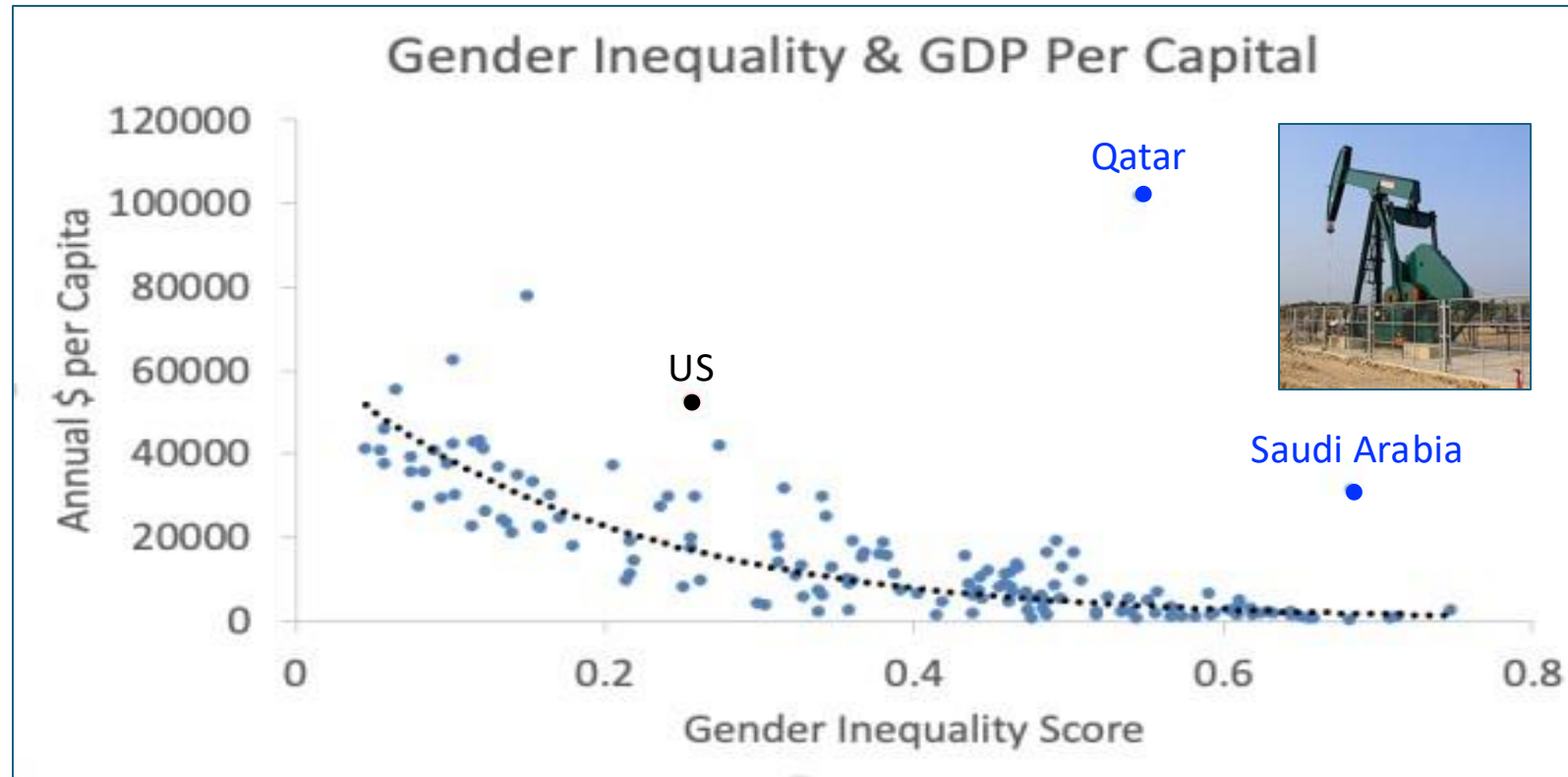


One of these cultural changes is female empowerment.  
This is why gender inequality is correlated with high birth rates.



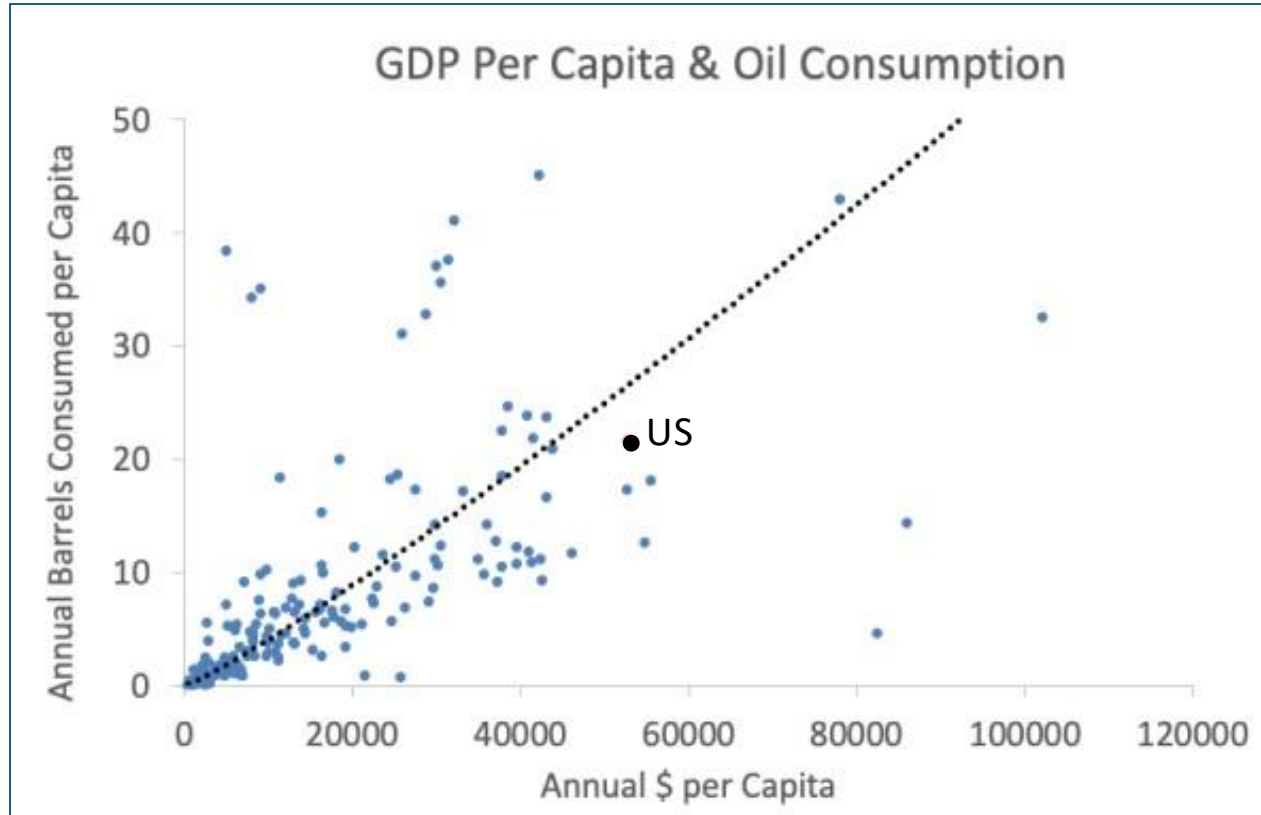
Sources: CIA Factbook (data from 2012-2015) and UN Human Development Programme Reports (2012).  
Each point represents a nation.

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.

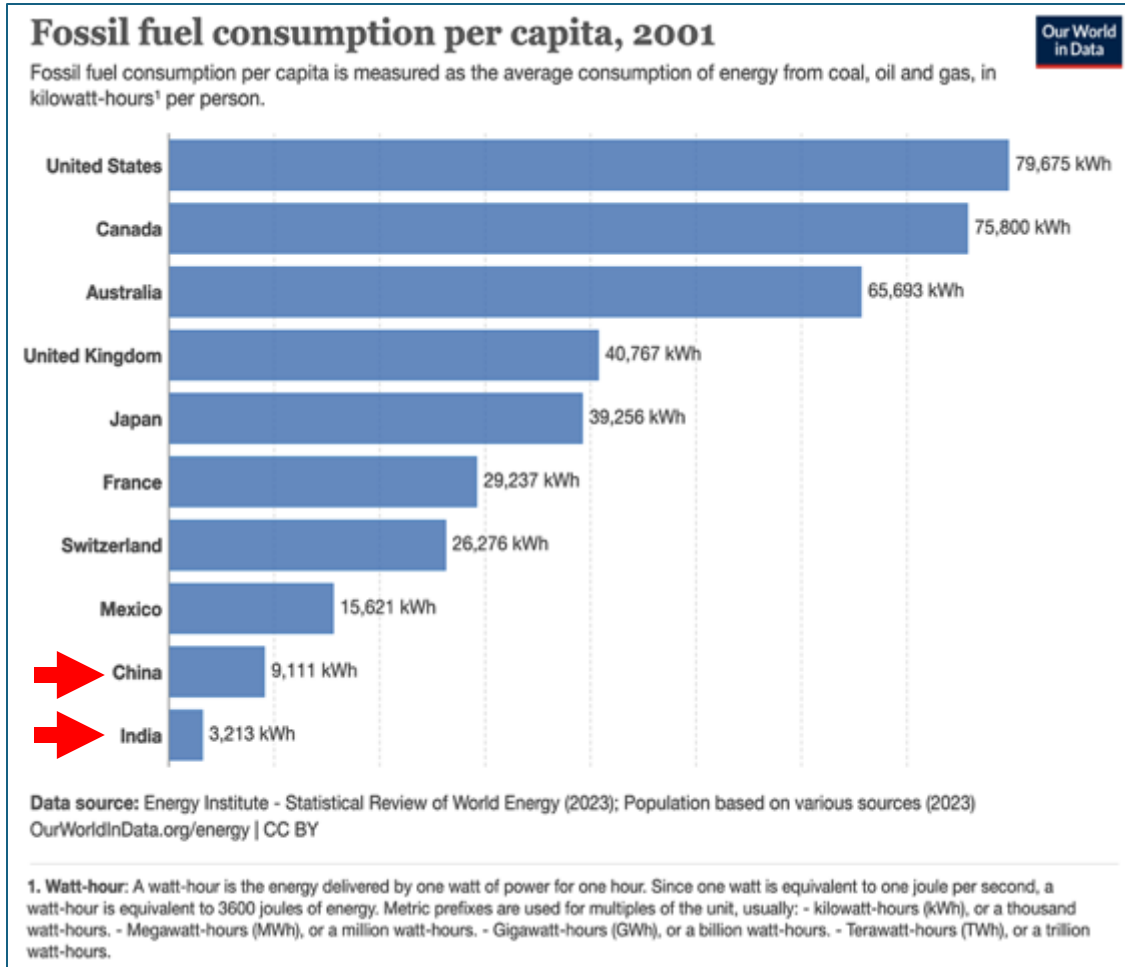
Population growth is not the only driver of growing environmental pressures:  
Affluent nations usually consume more fossil fuels per capita...



Sources: 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.

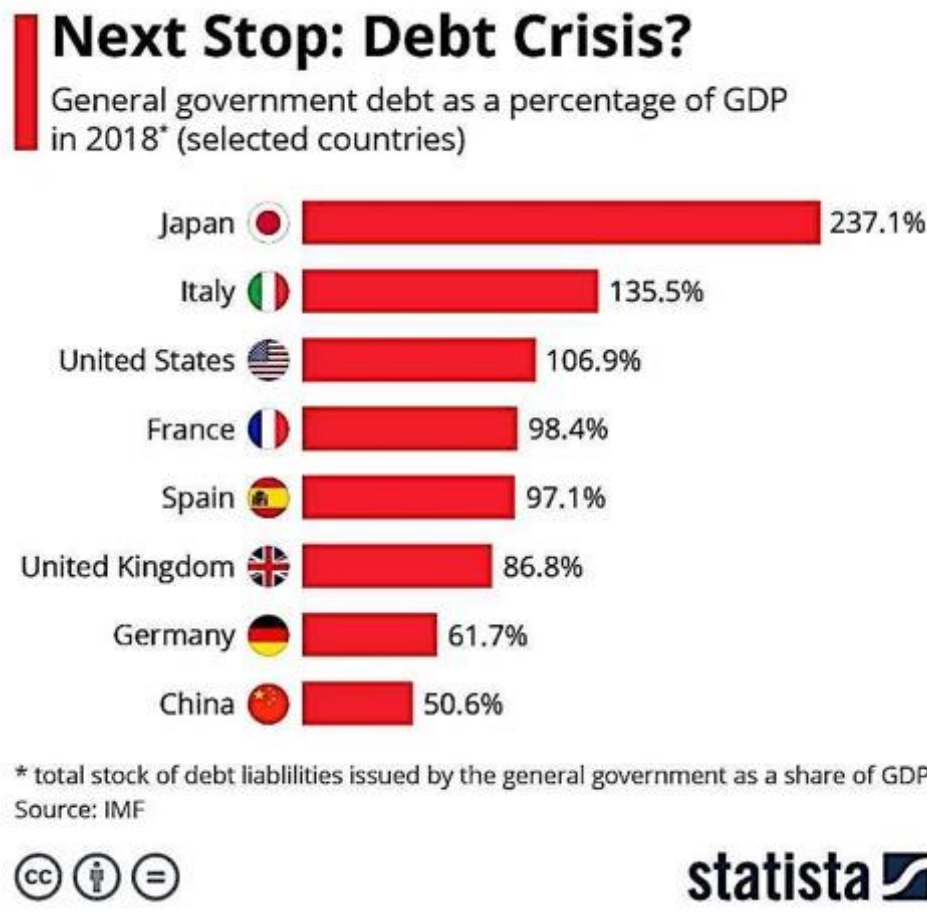
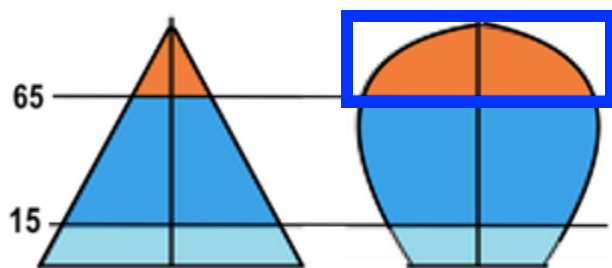
...and Americans use significantly more resources than Western Europeans with comparable standards of living.

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

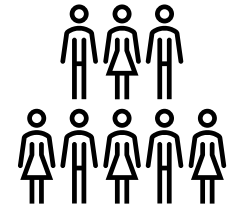


Declining population may ease pressures on the environment, but it can incur economic hardships: Nations with **falling birth rates** struggle to finance the **increasing number of retirees** that outlive their contributions to social security.

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



## 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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