CIE Geography A-level

4: Population

Detailed Notes

Understanding Population

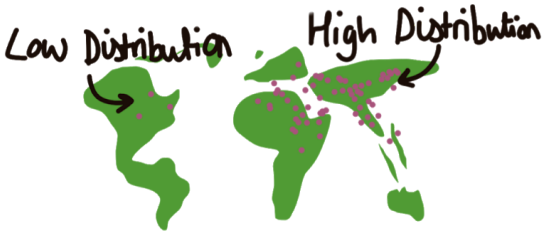
Population is the **amount of people** in a defined area, e.g. the **population of the world** is currently 7.6 billion (May 2018). Population can be **measured** in different ways:

Key Population Parameters

A parameter is a **measurable** factor. Population parameters are different ways in which the **population** is measured, and these are very useful to gain some insight into the **characteristics of a population.**

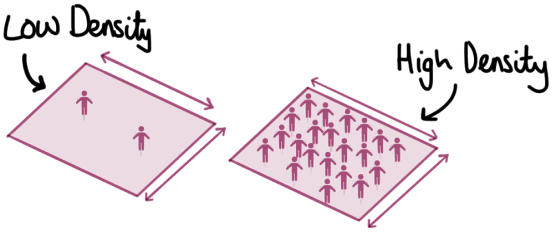
Distribution

How a population is **spread** globally or regionally.



Density

Measurement of population **per unit area**, e.g. population per km^2.



Numbers

The **amount of people** in a defined area (population) e.g. a town, a region, or a country.

Change

Increases and **decreases** in population over a **period of time**.

Natural Increase

Natural population change is affected by multiple factors influencing the total population of an area:

- **Birth rate**: Number of **live births** per 1000 of the population per year.
- **Death (mortality) rate**: Number of **deaths** per 1000 of the population per year.
- **Infant mortality rate:** Number of **deaths of infants** under the age of 1 per 1000 of the **live births** per year.
- **Total fertility rate:** The **average number of children** a mother will birth in her **reproductive** age.
- **Natural increase rate:** **% change** (in a year), calculated by the **birth rate subtracted by the death rate**. If birth rates exceed death rates, % change is positive, if death rates exceed birth rates, % change is negative.

Health, Mortality, and Morbidity

HEALTH Physical and mental well-being

MORTALITY Death

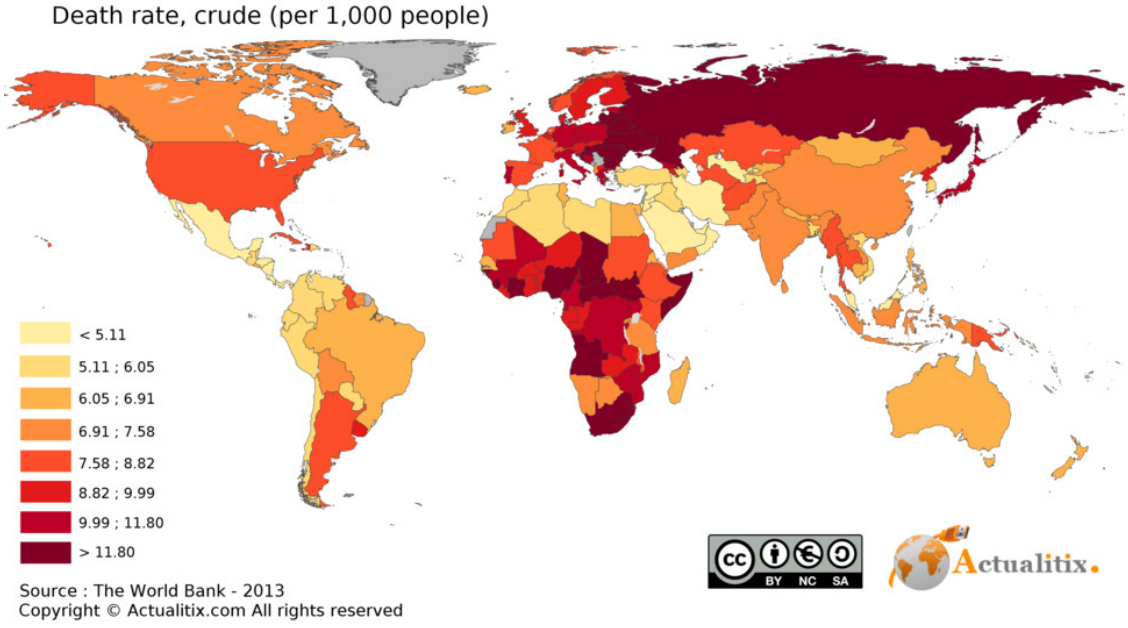
MORBIDITY Illness from disease

Health, mortality, and morbidity can be used as **indicators** of a population's development.

Mortality can be numerically measured by **mortality rate** (number of deaths over time, per unit of population - usually per 1000) and morbidity can be measured by **disease incidence** or **prevalence**. Health can be measured using a range of measures, including mortality and morbidity rates. Mortality rates are greatly affected by morbidity (although mortality is also affected by war, genocide and other **unnatural** causes of death).

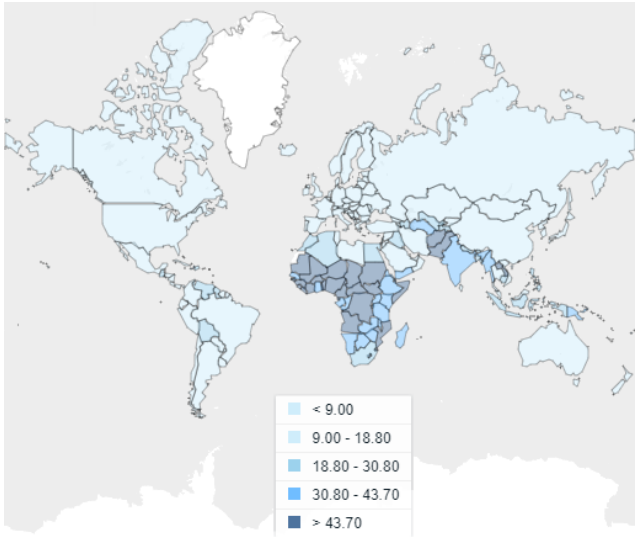
Patterns of Mortality

Mortality rates do vary throughout the world, and provide some indication of the **socioeconomic status** of a region/country. **Crude death rates** are highest in all but Northern **Africa** - a low income region - but are also high in **Russia** and **Eastern Europe**. Mortality is particularly low in **Central America** and the **Middle East.**



Infant mortality (the amount of infants that die per 1000 births) is another indicator of **mortality**, and perhaps a better indicator of the **socioeconomics** of a region. Infant mortality is highest in Africa, as well as Pakistan, Afghanistan, and Laos.

Infant mortality rates are usually lower in high income, developed countries, such as in the regions of Europe and North America.



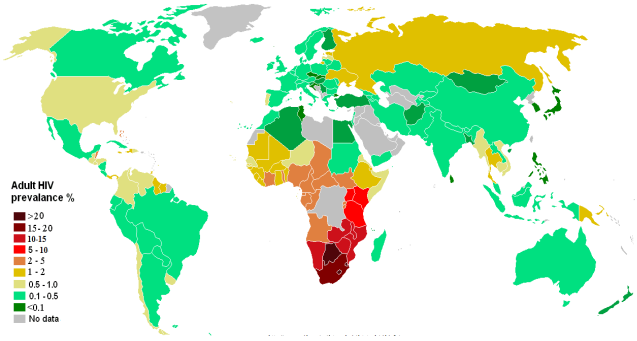
The map to the right shows infant mortality rates per country, 2017.
Source:https://data.worldbank.org/indicator/SP.DYN.IMRT.IN?view=map)

Patterns of Morbidity (and Health)

The **incidence** and **prevalence** of disease **varies regionally**, and morbidity rates can be used to show **the severity of a disease in a particular country**. **Morbidity rates** may also be used as a reflection of **the general health of the population**; countries with a **higher prevalence of disease** may be seen as less 'healthy', as overall the proportion of people in the population who are unwell is **higher**.

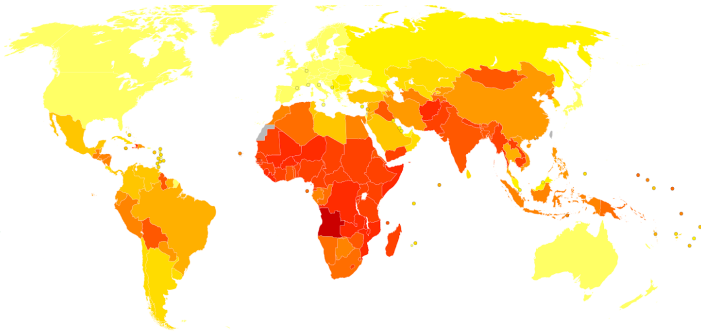
Morbidity rates are shown through **the incidence** of diseases. In general, **non-communicable diseases** are higher in HICs, whereas **infectious diseases** or **biologically transmitted diseases** are more prevalent in LICs. This trend can be seen in the maps below; note how infectious diseases are higher in poorer regions such as Africa.

HIV prevalence



(Source:https://upload.wikimedia.org/wikipedia/commons/d/d7/]HIV_Epidem.png)

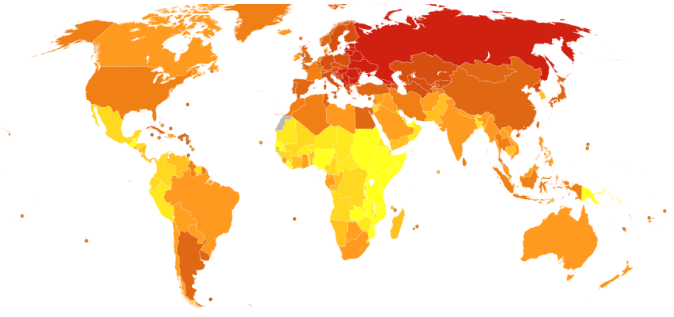
Diarrhoeal Diseases prevalence



(Source:http:/upload.wikimedia.org/wikipedia/commons/5/51/Diarrhoeal_diseases_world_map)

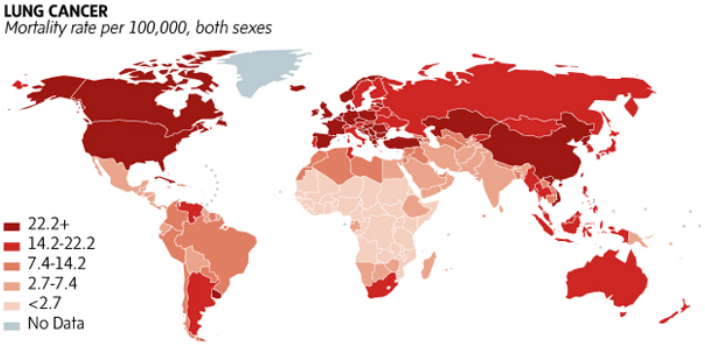
As previously mentioned, some diseases are more prevalent in **high income countries**. These diseases are usually influenced by lifestyle choices, e.g. lung cancer can be caused by smoking or poor air quality.

Cardiovascular Disease Prevalence



(Source:commons.wikimedia.org/w/index.php?curid=50287978)

Lung Cancer Prevalence



(Source:www.theglobeandmail.com/life/health-and-fitness/health/five-maps-that-put-cancers-global-spread-into-focus/)

A mortality rate of a disease is dependent on the ability to **treat morbidity**. In general mortality rates are lower than morbidity rates as people can usually be treated. However, the proportion of those who die from the disease they have contracted is higher in LICs than HICs.

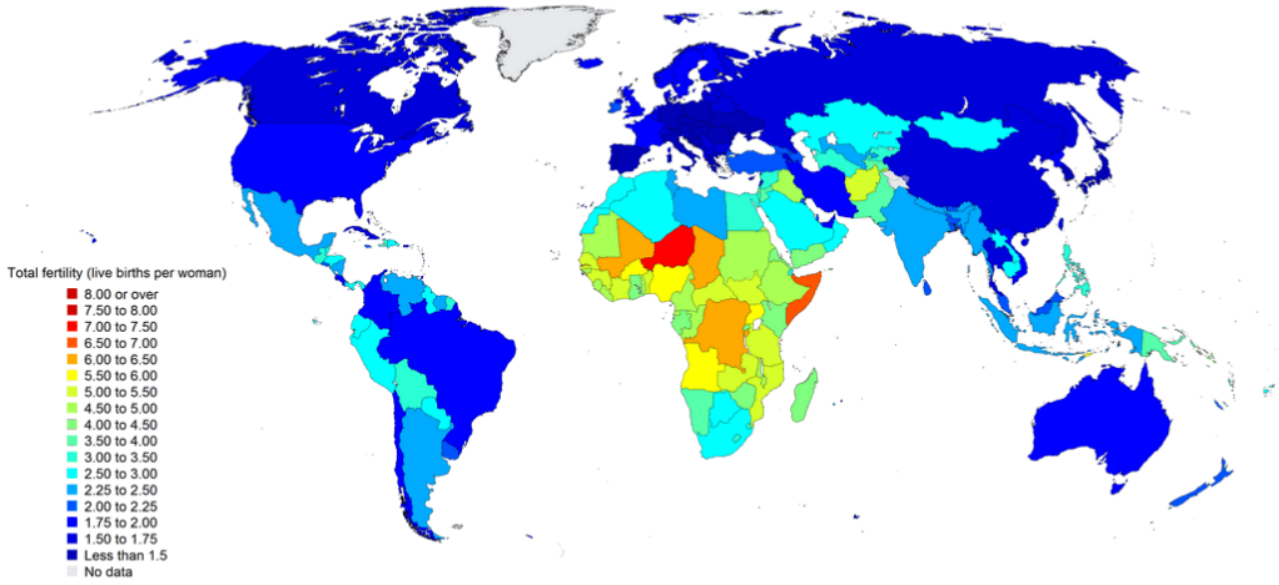
Fertility

In general, **fertility rates are lower in HICs than LICs.** This is due to a number of reasons, for example:

- Less need for a larger family
- Access to contraception
- Emancipation of women

The societal reasons behind why fertility rates decrease are explained in **Stage 3 of the Demographic Transition Model**, which will be explored later.

Total fertility, estimates, 2010-2015



Population Structure

All populations have a set structure with demographic variables:

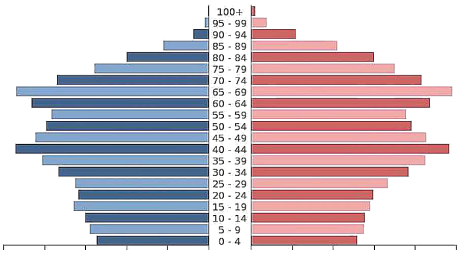
- Age
- Gender
- The **economically active**: These are people, usually aged between the ages of 15-65, that **contribute to the economy** through labour.
- The **dependants**: Dependants are generally not working, meaning they do not contribute to the economy. Dependants are split up into **young dependants** (under 15) and **elderly dependants** (over 65). These are groups of people who are **dependent on the contributions of the economically active** to provide for their economy/them.

Dependency Ratio

The **dependency ratio** is the **proportion** of those **economically active** to those who are **dependants**. A **high** dependency ratio indicates there are **a high proportion of dependants in the population compared to the economically active**. High dependency ratios usually indicate that there is more **pressure** on the working population, as there are more people to provide for, and less people providing.

Issues associated with dependent populations

Elderly populations

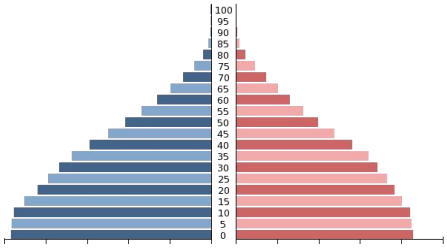


Elderly populations have a **high proportion of elderly people** in comparison to the economically active and youthful dependants. This causes a population pyramid with a **wide top** and a thinner base.

Elderly populations can cause several issues:

- More welfare spending (i.e. pensions and other benefits). **In 2014/2015, 55% of welfare spending was spent on pensioners**, and this is set to rise as the elderly population does.
- More pressure and spending in the **NHS**, as older people usually require more healthcare. This impacts those who use the NHS, as there is less time and resources available.
- Higher demand for **healthcare/ social care professionals** to support the elderly population, leading to **pressure on these services** when there is **not enough labour available**.
- A lower proportion of people in work, leading to **lower tax revenues**.

Youthful populations



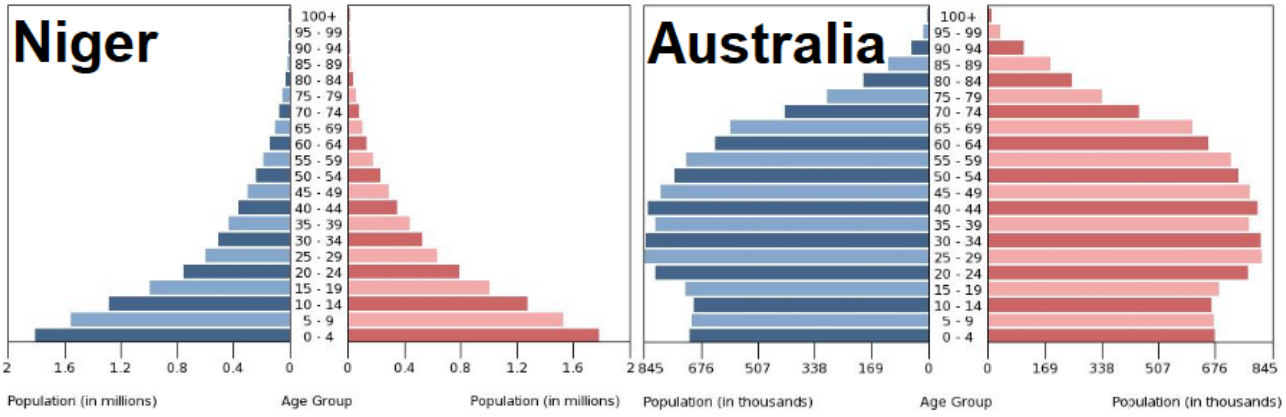
Youthful populations have a **high proportion of young dependants** This causes a population pyramid with a **wide base** and a thin top.

Youthful populations can cause several issues:

- **Government expenditures** into **education**, **childcare**, **healthcare** etc. with less people in proportion putting money **into** the government through taxes etc.
- Larger **workforce** required to support the needs of youths, which puts **pressure** on these services (e.g. larger class sizes in school because there are too few teachers)
- If fertility rates do not **replace** the population, then eventually there will be a larger **elderly population**, bringing the issues associated with it.

Age-Sex Composition

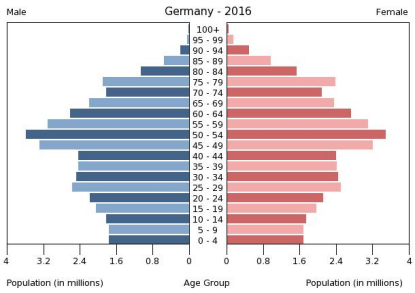
Age and **sex** are the two major demographic variables in a population, and these variables can indicate a country's level of development. Age-sex composition can be shown on graphs known as **population pyramids**. Below are 2 contrasting population pyramids:



(Source: CIA World Factbook. Left (blue) is male population and right (red) is female population. Data is from 2016.)

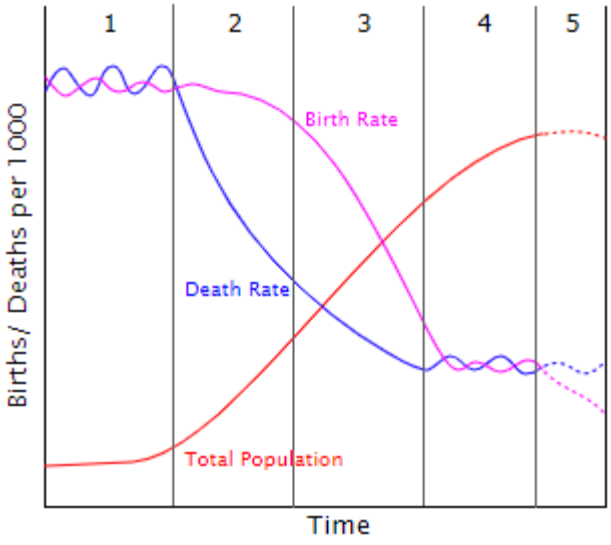
There are several things to note:

- LICs usually have population pyramids with **wide bases**, reflecting the **high fertility rates**.There is usually a large decrease in the population between the **0-4 age group and the 5-9 age group**, indicating a **high infant mortality rate**.
- HICs usually have a higher proportion of **elderly dependants** than LICs, due to better healthcare and quality of life reducing **morbidity**. Compare the proportion of elderly dependants in Niger to Australia.
- In many LICs, there is a very **high dependency ratio** due to the high fertility rates (seen in Niger).
- In MICs and some HICs, there may be a large proportion of **economically active** people, shown in Australia by the bulge between 15-65. This is known as a **demographic dividend**.
- In HICs, there may be an **ageing population**, causing a **high proportion of elderly dependants**. In many HICs, this could be a possible issue in the future if the number of economically active is not in proportion to the number of elderly dependants. This population pyramid of Germany shows an ageing population, which is characterised by a **large bump at the top of the pyramid**.



Demographic Transition

The trends of **natural population change** (from the start of a population to present day) is represented within the **Demographic Transition Model (DTM)**. This model shows how the birth rate and death rate change over time, and how this affects population numbers. In general, birth rates and death rates have both decreased.



The model is separated into 5 stages, which are reflective of a country's **level of development**. Usually, **lower stages** of the DTM usually indicate the country is **less developed**.

Stage 1

High, fluctuating birth and death rates due to high levels of **disease**, **pestilence**, **famine** etc. **Birth control** is virtually **non-existent**, giving reason as to why birth rates are **high**, although they **fluctuate in correspondence to pestilence/disease/famine** etc.

Population remains **constant and low**, as birth rates do not exceed the equally **high death rates**. Population is dependent on food, meaning any **limits to food supply** (e.g. from droughts or other disasters) would have significant effects on **population**. It is generally agreed that there are very few populations that are still in stage 1 of the model, aside from perhaps tribal communities.

Stage 2

This stage is characterised by a **fall in death rates**. The reason behind the fall in death rates is due to major **societal developments**, for example the Agricultural Revolution.

Advancements in **healthcare**, **hygiene**, and general **living standards** lower the **incidence of disease**, causing **less deaths** in that respect. Furthermore, increased **food security** also leads to less famines etc. lowering the **death rate**. **Birth rates** are still **high** (although it is important to note they are not increasing generally, they just **remain** high) leading to a **rapid increase in population** as there are more people living. A notable example of a country in this stage would be **Angola**, although many Sub-Saharan African countries, as well as Yemen, Afghanistan, and Iraq, fall into this category.

Stage 3

In stage 3, **birth rates start to fall** due to further **societal developments** (lower fertility rates) These changes in society are less concerned with **health and food** like in stage 2; they are instead **cultural and social changes**. For example:

- **The emancipation of women**: **Women's rights** become more **recognised societally** in this stage; it becomes **more socially acceptable** for women to choose whether they wish to have children, and how many they choose to have. Women are no longer seen as **child bearers**, but instead are **beginning to work** and earn their own living, decreasing birth rates.
- **Contraception**: Developments in science **and** the right for women to choose both lead to the development of **contraceptive methods** for birth control. The availability of contraception allows birth rates to fall.
- **Reduced need for large families**: As society develops, the need for a **large family** is reduced. In the past, children were **assets** to a family for **labour**, e.g. providing work on farms. As **society develops**, there is a shift in **industry** causing there to be less need for large families, e.g. living in an **urbanised** area. Furthermore, as death rates have previously fallen, it is now recognised that there isn't a need for many children (i.e. there is less risk of them dying and the parents being left without carers).
- **Education and change in societal values**: Higher **literacy** rates (especially in women), education about **contraception**, and a more educated **workforce** all lower the need for many children. Furthermore, society's view of the **'ideal family'** changes, and it is no longer an expectation to have a large family, causing birth rates to fall.

Many Low-Middle income countries are in this stage, including Mexico and India (both rapidly developing economies).

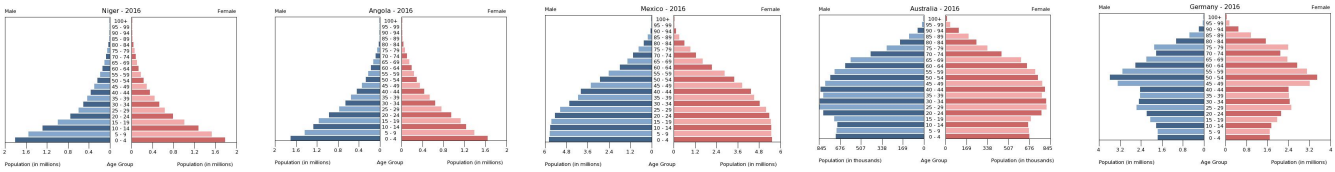
Stage 4

Birth rates and death rates are both **low**, causing **population growth to slow**, but still grow overall. The majority of high income, developed countries are in this stage, including the UK.

Stage 5

This stage is not officially in the model, but has been proposed. In this model, **birth rates fall below death rates**, causing a **decline** in population. Germany is usually named as an example of a stage 5 country, however unnatural population growth (migration) is changing the population structure.

Age-sex composition graphs (population pyramids) can be related to the different stages of the DTM.

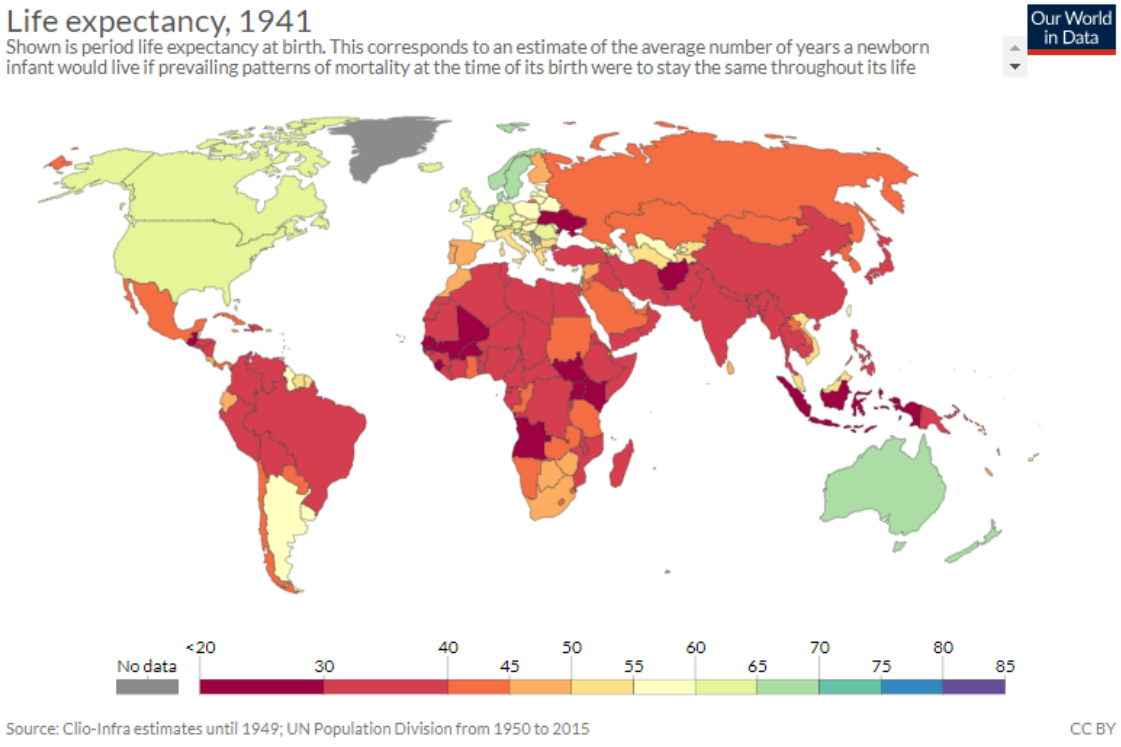


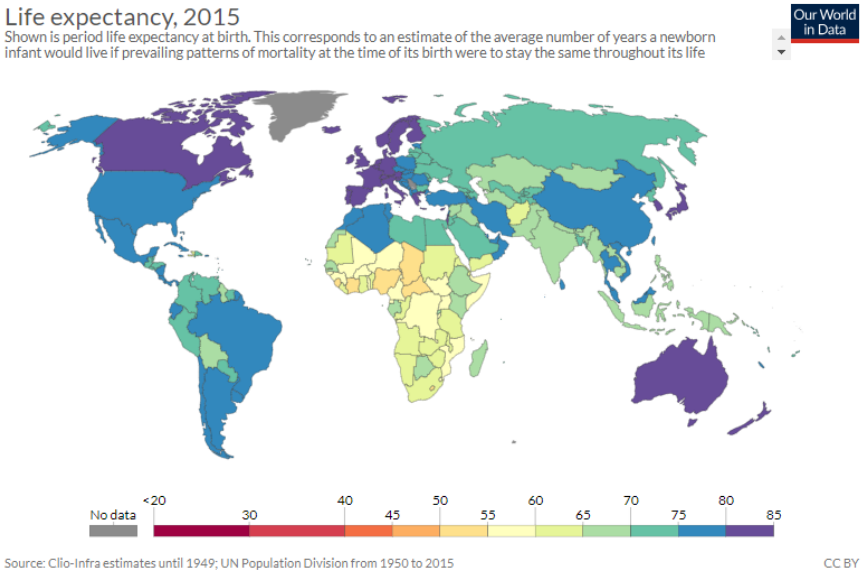
(Source: CIA World Factbook. Left (blue) is male population and right is female population)

STAGE 1 **STAGE 2** **STAGE 3** **STAGE 4** **STAGE 5?**

How Development Affects Life Expectancy and Infant Mortality

Over time, it can clearly be seen that **life expectancy has increased**. This is due to developments **globally**, including healthcare, education, and better hygiene.



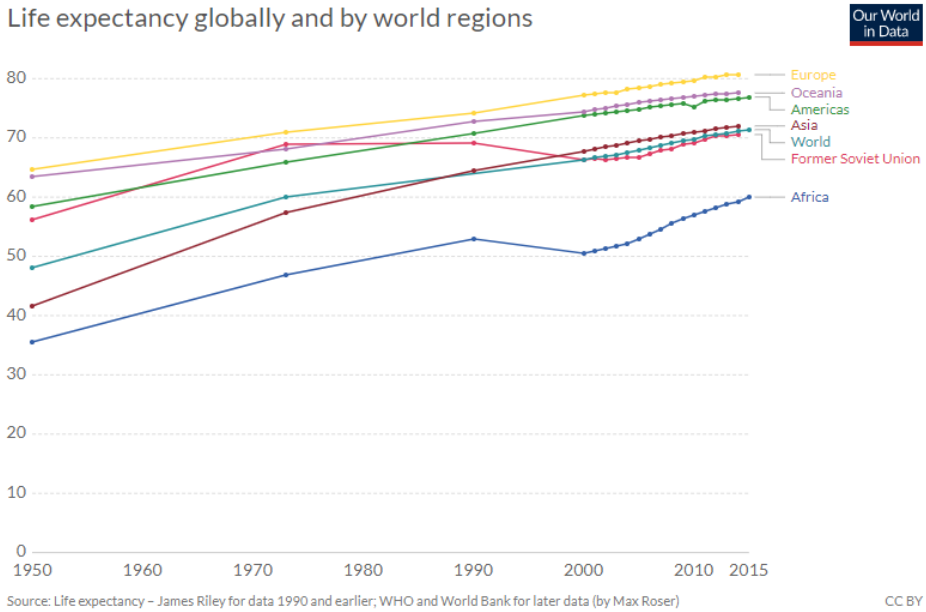


Development affects life expectancy in many ways:

- In general, life expectancy is higher in **high income countries** that are more **developed**. This is demonstrated by Western/Northern Europe, Australia, Canada, and Japan having the **highest life expectancies (80-85)**. This trend of HICs having a higher life expectancy has been the case over time, these countries (aside from Japan) **had higher life expectancies in the 40s/50s** in comparison to the rest of the world.

- In contrast, the **lowest income countries** have the **lowest life expectancies**. This is most likely due to the poorer healthcare, water quality, sanitation etc. causing higher **morbidity** (illness). Sub-Saharan African countries have the lowest life expectancies, although this life expectancy has increased significantly since 1945, where many countries in Africa had life expectancies that were under 40.

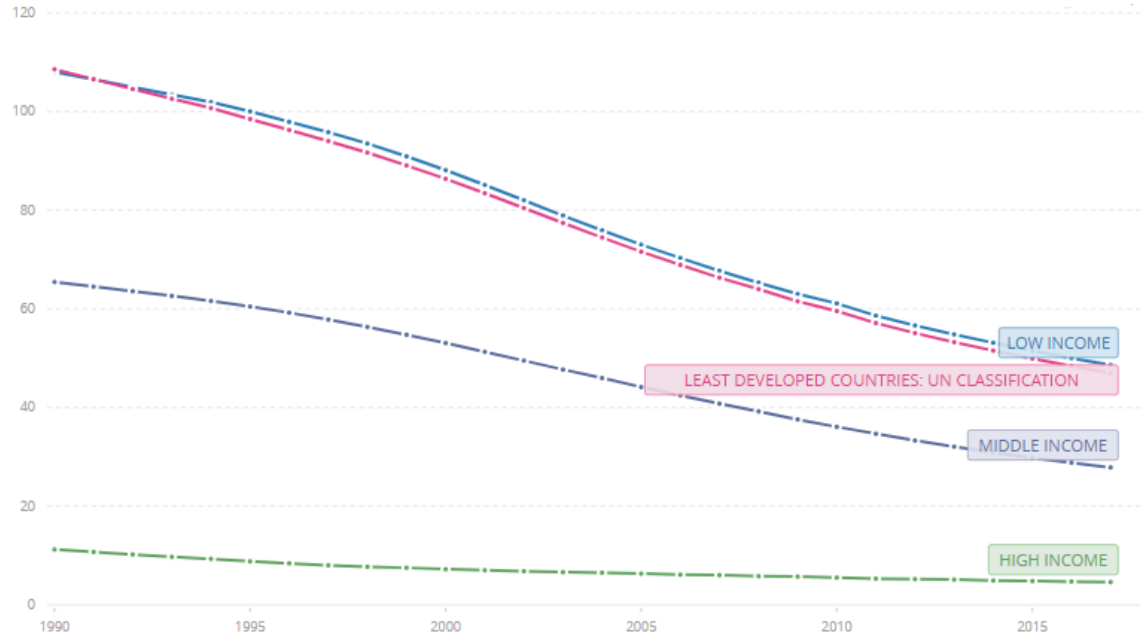
- The **rate of change** of life expectancies is reflective of **the rate of development**. HICs were at a more stable state of development before LICs, meaning the rate at which the life expectancy has increased is slower. In Africa, contrastingly, the life expectancy has grown **rapidly**, but is still low.



Infant mortality is higher in **less developed countries** because there are **less means of keeping a baby healthy** and **preventing illness** when countries have less money/ services available. E.g.:

- **Little/no access to specialist care for babies**, meaning birth complications or issues with newborns cannot be rectified as easily and safely. This causes morbidity in many children, which can lead to infant mortality.
- Poor **sanitation** and poor **access to clean drinking water**, causing infections, illness, and dehydration. All of these are **very dangerous** to a newborn, and often fatal.
- **Food insecurity**, causing **malnutrition** and **illness**, often leading to death.

The graph below shows **infant mortality rates over time**. In general, it can be seen that infant mortality rates are **higher in less developed countries**, but there is also the most **rapid decrease** of infant mortality in these countries.



(Source: http://www.worldbank.org/: Mortality rate, infant (per 1,000 live births))

Population-resource relationships

Food Security

Food security is the concept of having **available**, **accessible**, and **affordable** food that is safe and **nutritious**, so that people may live a **healthy** lifestyle.

Food insecurity

Not every population in the world has **food security**, in fact **1 in 10 people** globally experience **chronic hunger** as they do not have access to sufficient food. **Food shortages** occur globally for a number of reasons, shown on the next page:

Environmental Factors

- **Crops and livestock** need to be in certain **climates** to thrive. They need the right amount of water, sunlight, and heat in order to survive. In **extreme climates**, there may be food shortages because food cannot **grow there**.
- Climatic hazards such as **floods, droughts, tropical storms, and wildfires** can be detrimental to **crops and livestock**. Annual crop yields can be **severely affected** by these events, causing food shortages.

Economic Factors

- Lower Income Countries may lack the funding for **agricultural technology and innovation** (e.g. high yielding varieties of crops, equipment such as combine harvesters, equipment to dry/store crops etc). This causes less **productivity** and thus **food shortages**.
- In areas where agricultural productivity is poor, there is still opportunity to **purchase food from other areas where productivity is higher**. However, in **poorer areas**, many cannot afford to **buy food**, exemplifying the food shortages in LICs especially.

Political Factors

- **Wars and severe political instability** can majorly disrupt **food supplies** in a country. High death rates, displacement, and disruption to society can make it difficult to source food through growing it or importing it.
- Global links, e.g. **trade agreements**, can affect food supplies. Populations may be subject to food shortages if their country does not have a **good deal** with other countries.

Effects of food shortages:

- Due to the **lack of food available**, and also the **lack of variety of food** when crops fail, widespread **malnutrition** and **famines** are common when there are food shortages.
- **Deficiencies** due to a lack in **variety** in food, causing diseases like rickets.
- People cannot afford to be picky when there is less food available, meaning many eat **poor quality food** to get by. **Lower quality food** can leave people vulnerable to **a range of illnesses if the food is contaminated**, such as **diarrhoeal diseases** or **food poisoning**.
- In areas where **biologically transmitted diseases are common**, malnutrition makes people **less able to fight the disease**, i.e. it is harder for the body to respond to - for example - malaria or diarrhoeal diseases when it is already malnourished.
- When agricultural yields fail, **food prices can increase dramatically** (as supply significantly decreases). For example, in 2016 maize prices in Malawi were **192% higher** than the five-year average (many crops failed due to the extreme climatic event El Niño). When food prices rise, people can no longer afford a **variety of food,** meaning nutritional standards decrease, causing ill health.

Strategies to Ensure Food Security

There are strategies to **overcome food insecurity**; not only can **more food be produced**, but the food that is available can be made more **accessible**, and waste can be reduced to **save food**.

Increasing access

Increasing a country's access to **foreign markets** means they can import food, increasing food security.

Trading agreements such as **trade blocs** can be very beneficial to a country that is struggling to **provide enough food** for its population.

In times where food security is dangerously limited, such as after a crisis or natural disaster, **aid** and **relief** can also increase food security.

Increasing amount

Strategies and **new technology** (e.g. GM crops) can increase the amount of food being produced, which therefore increases food security as there is more food **available**, and this food may also be **healthier**.

Managing farms more successfully through training, farming equipment, and **high yielding varieties** (HYVs) can increase food supplies. This means a country has more food **available** to distribute to its population.

Increasing efficiency

Similar to increasing the amount of food, increasing the efficiency of a farm can save time and food, meaning overall there is more food **available** and it may be more **affordable** as there are **less expenditures**.

Equipment and **better management** can produce more crops in less time, helping affordability and availability of food.

Waste can be reduced by harvesting natural resources and having better storage.

Green Revolution

The Green Revolution (mid-20th century) is an example of how **technology** increased **food security** by increasing the **amount** of food and the **efficiency of a farm** - specifically in developing regions.

The increased use of **fertilisers/pesticides**, **mechanisation**, **irrigation**, and development of **high yielding varieties** (HYVs) increased yields in areas such as India.

The Green Revolution is thought to be responsible for increased calorie intake in low income countries, e.g. it is thought to have **raised grain yields by 160%**. However, there have been issues associated with the revolution, such as **salinisation** caused by irrigation, or farmers **unable to repay loans** on expensive equipment.

Practical Action

Practical Action work to show people **practical ways** to overcome issues such as **food insecurity**. By increasing efficiency of food practices, the **amount of food** and its **quality** is increased.

For example, Practical Action have worked to incorporate **rainwater harvesting** in disadvantaged communities to save water for drinking and agriculture. **Zeer pot fridges** are another example of Practical Action's work; these easily made pots are naturally cool, making them useful for preserving food in hot climates.

Global Agriculture & Food Security Programme (GAFSP)

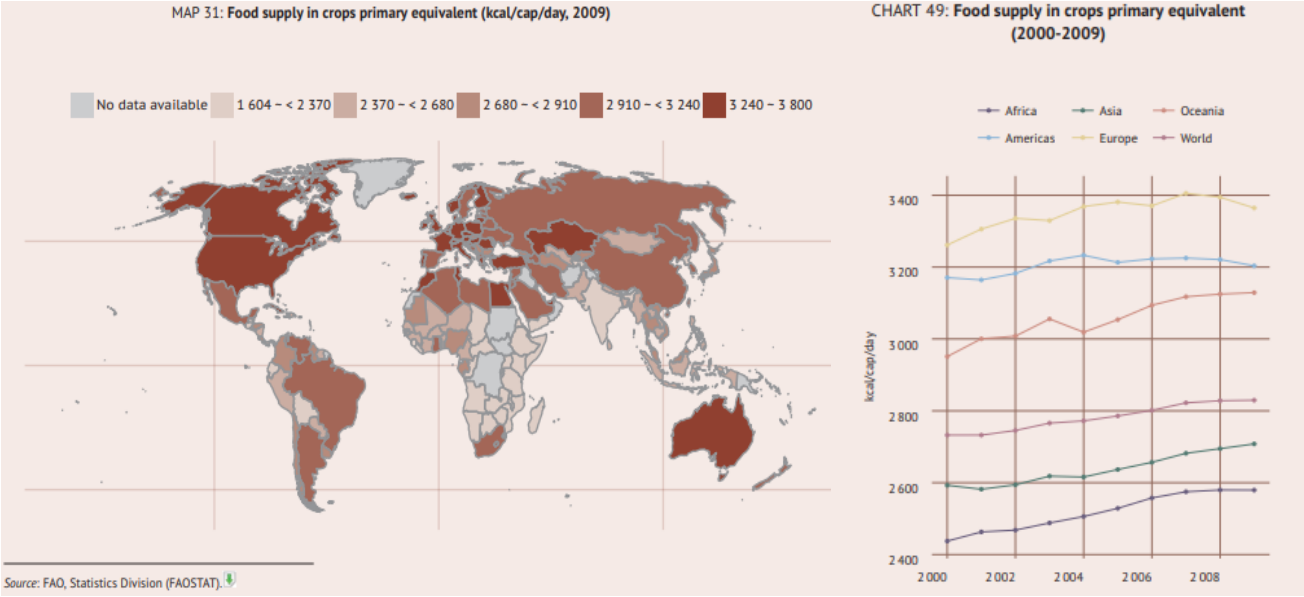
GAFSP is a global partnership that supports sustainable agriculture in developing countries, with the intention of creating **food security**. It works to increase the **efficiency** of smallholder farmers.

For example, a GAFSP funded programme in **Rwanda** increased some yields by 30%. Training communities and farmers in efficient practices such as crop drying and compost making helped to increase yields and save money for more investments.

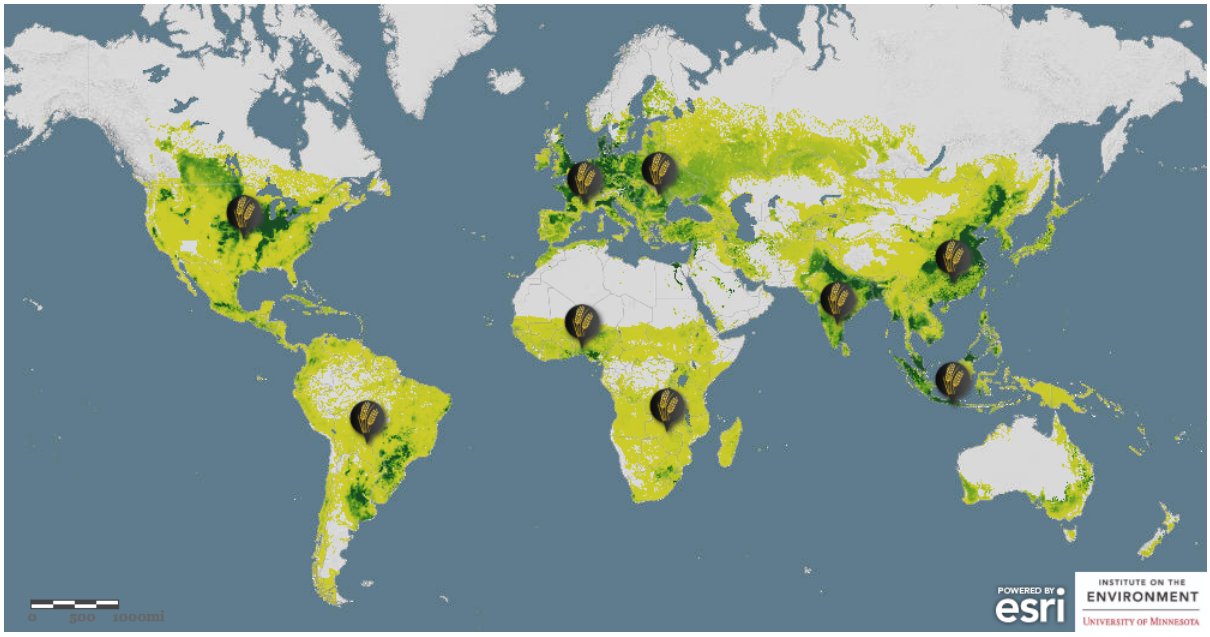
Food production has increased in **different regions** for **different reasons**. For example, wheat and rice production has increased in Asia and Northern Africa due to **higher yields**, whereas maize production in Latin America and the Caribbean has increased due to methods of **land expansion** (creating more arable land).

In general, **food production is unevenly distributed**, with lower income countries producing the least amount of crops. The richest countries have the largest food supplies, meaning they produce enough/more calories for their population. This production trend varies crop by crop, usually due to **environmental limitations** in other countries, meaning consequent lower crops.

Global Food Production per Region



Current Regional Crop Yields



(Source: http://storymaps.esri.com/stories/feedingtheworld/)

Examples of Regions with Differing Crop Yields

- **Eastern Asia**
- **North America**
- **Western Europe**

These areas have consistent **high yields**, due to the availability of resources, such as nutrients and water. Eastern Asia receives high amounts of rainfall, facilitating in **crop growth**. **The Great Plains** in Central North America also create high yields.

- **India**
- **South America**
- **Western Africa**

These areas have moderate yields, but can be at risk of **environmental limitations**, such as droughts and flooding, especially due to **climate change**.

- **Central Australia**
- **Saharan Africa**
- **Eastern Russia**

Due to **extreme environmental limitations**, such as droughts and temperatures unsuitable for crop growth, these regions of the world have little if no crop growth to feed the population.

For regional crop yields information, visit the FAO's factfile: (www.fao.org/docrep/018/i3107e/i3107e03.pdf)

Population Ecology

Population ecology is the study of how the **environment affects population** factors, such as size, distribution, density, age-sex composition etc.

Carrying Capacity

The carrying capacity is the **maximum population** that can be supported in an environment without the **environment being severely degraded**.

If the carrying capacity is reached it can have **effects on the population** as resources are no longer available to support the population. This is thought to lead to an increase **in death rates** and **fall in birth rates** until population numbers can be supported again (e.g. famines due to lack of food, causing deaths and lower fertility rates).

Optimum population, underpopulation, and overpopulation

An environment that supports a population can be of **optimum population**, or it could be **underpopulated** or **overpopulated**.

Overpopulation	Optimum population	Underpopulation
Too many people to be supported by the environment and its resources.	The **ideal** number of people for the environment and its resources.	**Too little** people to fully utilise the environment and its resources.

Populations rely on their **environment and its resources** in order to be supported. Overpopulation and underpopulation are not necessarily concerned with how many **people there are**, but rather how many **resources there are in order to support the people**.

Take these 3 populations for example.

= 1 person = the amount of food and resources needed for 1 person.

Community 1

Community 2

Community 3

If an area had this amount of resources:

...**then community 2 would be the optimum population**, community 1 would be overpopulated (as there are too many people compared to the resources available), and community 3 would be underpopulated (as there are too few people to utilise the resources).

But if an area had this amount of resources:

...**then community 3 has an optimum population**, whereas community 1 and community 2 are both overpopulated.

It is important to consider that just because an area is **densely populated**, it does not mean that it is **overpopulated** if there are enough resources to support the population. This is the same for sparsely populated areas not necessarily being **underpopulated**.