Overpopulation – an area’s population exceeds the capacity of the environment to support it.
Most Populous Countries in the World:

1. China
2. India
3. United States
4. Indonesia
5. Brazil
Distribution trends:

- People are distributed very unevenly.
- ½ of world’s people live in rural areas while ½ live in or near cities.
World Population Distribution and Density

- **East Asia**
  - 1/5 of world population here
  - China → most populous country
- **South Asia**
  - 1/5 of world population here
- **Europe**
  - Population is concentrated in cities
- **Southeast Asia**
  - 4th most populated region in the world
  - Indonesia → most populated in region

**2/3 of world’s population is clustered into these 4 regions!**

**Almost 1/2 of world’s population in East Asia & South Asia!!**

**Similarities Among Four Regions**

- 3 out of 4 are LDCs (& growing)
- Most live near water
There are more people living inside this circle than outside of it.
World Population Distribution & Climate Zones

Sparsely Populated Regions
– People avoid living in environments with conditions such as:
  - Too dry
  - Too wet
  - Too cold
  - Too high in elevation

Fig. 2-2: World population is unevenly distributed across the earth’s surface. Climate is one factor that affects population density.
2.2

**ARITHMETIC DENSITY**

\[
\text{# of people / (divided by) total land area}
\]

Compare conditions in different countries

---

**Fig. 2-4:** *Arithmetic* population *density* is the number of people per total land area. The highest densities are found in parts of Asia and Europe.
Physiological Density

# of people / area of arable (farmable) land

- Higher the physiological density, the greater the pressure that people may place on the land to produce enough food (not enough arable land)
- Comparing physiological & arithmetic densities = capacity of the land to have enough food for its people

**Fig. 2-5:** Physiological density is the number of people per arable land area. This is a good measure of the relation between population and agricultural resources in a society.
Agricultural Density

- **Agricultural Density**
  - # farmers / amount of arable land

- **Measure** → Economic differences (MDCs vs. LDCs)
  - $ for farming + technology = less workers

- **Low Agricultural Density** =
  - Small amount of farmers / large amount of arable land

- MDCs have lower agricultural densities because of technology and finance

- **High Agricultural Density** =
  - Large amount of farmers / small amount of arable land
AGRICULTURAL DENSITY

- # of farmers / amount of **arable land**

Which picture represents a HIGH agricultural density?

What crops are they both cultivating?
Identify some distinguishing characteristics between the different types of densities

### Measures of Population Density

**TABLE 2-1** Measures of Density in Selected Countries, Expressed as Population per Square Kilometer

<table>
<thead>
<tr>
<th>Country</th>
<th>Arithmetic Density</th>
<th>Physiological Density</th>
<th>Agricultural Density</th>
<th>Percent Farmers</th>
<th>Percent Arable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>3</td>
<td>71</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>United States</td>
<td>31</td>
<td>172</td>
<td>2</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Egypt</td>
<td>75</td>
<td>2,580</td>
<td>826</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>247</td>
<td>1,069</td>
<td>16</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Japan</td>
<td>338</td>
<td>2,907</td>
<td>145</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>India</td>
<td>350</td>
<td>699</td>
<td>419</td>
<td>60</td>
<td>56</td>
</tr>
<tr>
<td>Netherlands</td>
<td>400</td>
<td>1,798</td>
<td>72</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1,050</td>
<td>1,838</td>
<td>1,158</td>
<td>63</td>
<td>67</td>
</tr>
</tbody>
</table>

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What if the largest countries had the biggest populations?

Interesting coincidences:
- United States doesn't move
- Yemen doesn't move
- Brazil doesn't move
- Ireland doesn't move

* Depending on definition, China may include Taiwan and some areas which are claimed by India.
* Area of China is anywhere between 9,596,960 sq. miles and 9,440,000 sq. miles.
* USA area depends on the source. Some claim the USA territories and others do not.
* Area of the United States is anywhere between 3,676,486 sq. miles and 3,794,090 sq. miles.

en.wikipedia.org/wiki/List_of_countries_and_outlying_territories_by_total_area
en.wikipedia.org/wiki/List_of_countries_by_population
INTRODUCTION OF MDCS AND LDCS

• **MDCs – More Developed Countries**
  – Highly *developed* economy & advanced technological infrastructure
    • I.E. North America, Australia, Europe & Japan
      – Higher income, literacy rates, television, & access to hospitals
      – Jobs involve technology

• **LDCs – Less Developed Countries**
  – Lower living standard, underdeveloped industrial base, & lack technology or infrastructure → *developing*
    • I.E. Sub-Saharan Africa, Middle East, Asia, & Latin America
      – Jobs mainly in agriculture & mining
MEASURING POPULATION & COMPARISONS:

1. **Crude Birth Rate (CBR)** - total number of live births in a year for every 1,000 people
   - \( \text{CBR} \rightarrow \text{FERTILITY} \)

2. **Crude Death Rate (CDR)** - number of deaths in a year for every 1,000 people
   - \( \text{CDR} \rightarrow \text{Mortality} \)

3. **Natural Increase Rate (NIR)** - % by which a population grows/declines in a year
   - \( \text{NIR} = \text{CBR} - \text{CDR} \) (then convert to %)
   - Represents country’s growth rate excluding migration
   - **NIR globally** is (1.2%) (pop. Growing) \( \rightarrow \) lower than in the past
   - Peak in 1963 of 2.2%
Fig. 2-8: The **crude birth rate (CBR)** is the total number of births in a country per 1000 population per year.

**NOTE:** The highest rates are in Africa and several Asian countries. ➔ Why?
Fig. 2-12: The **crude death rate (CDR)** is the total number of deaths in a country per 1000 population per year.

**NOTE:** Because wealthy countries are in a late stage of the Demographic Transition, they often have a higher CDR than poorer countries.
Fig. 2-7: The **natural increase rate (NIR)** is the percentage growth or decline in the population of a country per year (*not including net migration*).

**NOTE:** Countries in Africa and Southwest Asia have the highest current rates, while Russia and some European countries have negative rates. → Why?
**Doubling Time** - number of years needed to double a population (assuming a constant rate of NIR)

- Formula is dividing 70 by the Rate of Natural Increase

At the current rate of NIR (1.2% per year) the population will double in **54 years**

(14 billion by 2066)

---

**Table 4.1**

<table>
<thead>
<tr>
<th>Annual Percentage Increase</th>
<th>Doubling Time (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>140</td>
</tr>
<tr>
<td>1.0</td>
<td>70</td>
</tr>
<tr>
<td>2.0</td>
<td>35</td>
</tr>
<tr>
<td>3.0</td>
<td>24</td>
</tr>
<tr>
<td>4.0</td>
<td>18</td>
</tr>
<tr>
<td>5.0</td>
<td>14</td>
</tr>
<tr>
<td>10.0</td>
<td>7</td>
</tr>
</tbody>
</table>
• **Total Fertility Rate (TFR)** - average number of children a woman will have throughout her childbearing years ➔ Ages 15-49

  – Used to measure number of births in a society
    • Sub-Saharan Africa = greater than 6
    • Europe = less than 2
  – TFR varies between MDCs and LDCs
  • **Replacement Rate** - # of births needed to keep a population @ a stable level without immigration ➔ TFR 2.1 needed to replace the present population

Globally TFR – 2.5

Predict future of women in a society
Today, the pace of world population growth is slowing.

Where have Total Fertility Rates (TFRs) fallen below replacement level and why? ________________________________

• NOTE: The lowest rates are in Europe, and the highest are in Africa and parts of the Middle East. ➔ Why? ________________________________
Fertility Levels in Selected World Regions, 1950 and 2005

Children per woman

- Asia: 5.9 (1950-55), 2.5 (2005)
- Latin America/Caribbean: 5.9 (1950-55), 2.6 (2005)
- North America: 3.5 (1950-55), 2.0 (2005)
- Europe: 2.7 (1950-55), 1.4 (2005)
Infant Mortality Rate (IMR) - annual number of deaths of infants under 1 year of age, compared with total live births

- Number of deaths per 1,000 births
- Causes of high IMR = dehydration, diarrhea, pneumonia, SIDS, & infections
- Highest rates in poorer countries in Africa
- Lowest Rates in Western Europe
- IMR reflects country’s health-care system
- Countries with Lower IMRs:
  - Well-trained doctors/nurses, modern hospitals, & supplies of medicine

How does a country decrease IMR?
Identify trends that have taken place in regards to the reduction of infant mortality.
Life Expectancy - at birth the average number of years a newborn infant can expect to live at current mortality levels

- QUALITY of LIFE in a country & MORTALITY of all ages
- LDCs lowest (generally 60s) → 40s in Africa
- Highest in wealthier countries, MDCs → 70s in Western Europe
**Dependency Ratio**

- **Dependency Ratio** – number of people who are too young or too old to work, compared to the number of people in their productive years
  - Larger percentage of dependents leads to increased financial burden on those trying to support
  - Age Ranges
    - 0 to 14 and 65 and older are considered dependents
- Large percentage (15%) of children in sub-Saharan Africa and other stage 2 countries strains ability of poor countries to provide needed services
  - Schools, hospitals, and day-care centers
- Large percentage of elderly in US, Canada, Europe
  - Financial assistance, medical care and programs
Who are DEPENDENTS in a society?

- **Dependency Rate** – % of people who are too young or too old to work in a society

- **Dependency Ratio** - number of people are too young or too old to work, compared to the number of productive people

  \[ \frac{\text{too young} + \text{too old}}{\text{productive people}} = \% \]

  - Three age groups used for comparison
    - 0 to 14
    - 15 to 64
    - 65 and older

  - 0 to 14 and 65 and older are considered dependents
    - Poorer countries have more __________
    - Wealthier countries have ________

  - Larger percentage of dependents (dependency rate) leads to increased financial burden on society
Dependent Population

• The dependency ratio is directly linked to a country’s age structure.

• To calculate it, the population is split into economically active (15-64) and inactive (0-14 and 65+)

• Dependency ratio is calculated as a % using:

$$\frac{\text{Number of economically active}}{\text{Number of non-economically active}} \times 100$$
Government Resources & Population → dependents

If population is TOO YOUNG then services needed are:

If population is TOO OLD then services needed are:
<table>
<thead>
<tr>
<th>TRENDS IN MDC versus LDC:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>MDCs -</strong></td>
</tr>
<tr>
<td><strong>LDCs -</strong></td>
</tr>
<tr>
<td><strong>FERTILITY</strong></td>
</tr>
<tr>
<td>- CBR</td>
</tr>
<tr>
<td>- TFR</td>
</tr>
<tr>
<td><strong>MORTALITY</strong></td>
</tr>
<tr>
<td>- CDR</td>
</tr>
<tr>
<td>- IMR</td>
</tr>
<tr>
<td><strong>HEALTH</strong></td>
</tr>
<tr>
<td>- Life expectancy</td>
</tr>
<tr>
<td>- Health care</td>
</tr>
<tr>
<td>- Sanitation</td>
</tr>
<tr>
<td>- Nutrition</td>
</tr>
<tr>
<td><strong>Other Demographics</strong></td>
</tr>
<tr>
<td>- NIR</td>
</tr>
<tr>
<td>- Doubling Time</td>
</tr>
<tr>
<td>- Dependents in society</td>
</tr>
</tbody>
</table>
Fig. 2-15: About one-third of world population is under 15, but the percentage by country varies from over 40% in most of Africa and some Asian countries, to under 20% in much of Europe.
Population Pyramids

- Age-sex pyramid that shows the distribution of males / females within a population every 5 years

- A country’s population by **AGE** and **GENDER** on a **BAR GRAPH**
  - MALES - on the left  - FEMALES - on the right

- Population pyramids help the needs and issues of the present/future

- Shape of pyramid (largely) determined by the **CBR**

Other factors influence the shape:
- Health care
- Impact of war
- Availability of birth control
- Cultural values
- Economic development
• For **poorer countries**, the chart is shaped like a **pyramid = Expansive**

• Infant mortality rates are high, life expectancy is shorter

• LDCs have wider base, because the majority of the population is under the age of 15 – few elderly people due to lack of sanitation and medical care

• Where are the dependents? ____________________________
For wealthier countries, the chart is lopsided vase (column)

Population is aging, TFRs are declining → narrowest in Europe

Where are the dependents? ____________________________
Which pyramid shows a "greying" population AKA upside down pyramid?

Which pyramid shows a college town?

Which shows an EXPANSIVE pyramid?

Which shows a stationary / column pyramid?

* Explain how different shapes result from ethnic and cultural differences.
EVOLUTION OF BABY BOOMERS

Source: Redrawn from Christine L. Himes, "Elderly Americans." Population Bulletin 56, no. 4 (Dec. 2001), Fig. 1, by permission of Population Reference Bureau.

Link to International Data Base
Causes of Population Decline = Declining BIRTH RATES

1. Lowering CBR - education & health care
   - The longer a girl attends school the more likely she learns employment skills and gains more economic control over their lives
   - Correlation between the longer girls are in school & the less children they have

2. Lowering CBR - contraceptive use
   - Acceptance of family planning programs can diffuse rapidly if CULTURALLY & POLITICALLY encouraged
   - Low status of women effects CBR
     - Especially in Africa
   - Some religions prevent use of birth-control devices & abortion
Government Population Policies

• **Expansive Population Policies**
  - Encourages population growth.

• **Eugenic Population Policies**
  - Favors one racial or cultural sector over others.

• **Restrictive Population Policies**
  - Range from toleration of unapproved birth control to outright prohibition of large families.

* What kind of political, cultural, & economic variables could be involved?
Anti-natalist and natalist policies

**ANTI-NATALIST (against birth)**
- Prevention of births
  - Family planning clinics
  - Free contraception
  - Investment in sex education
  - Advertising / media
  - Encouraging later marriages
  - Financial incentives
- Termination of births
  - Promoting sterilisation
  - Legalising abortion

**PRO-NATALIST (for birth)**
- Birth bonuses, both cash and goods
- Lower tax rates with increasing numbers of children
- Favoured treatment for housing and welfare benefits
What factors contribute to success?

- **Government attitude**
  - Commitment to the cause and a willingness to fund the policy are vital.

- **Involvement of population**
  - Working closely with people on a local level is crucial to gain support and co-operation

Most successful
CHINA’S ANTI-NATALIST POLICY

• Government’s anti-natalist policy
    • Government Incentives & penalties to assure couples produced one child
      – financial subsidies, long maternity leave, better housing
      – prohibited marriage for men until 22 & women until 20
      – People received free contraceptives, abortions, & sterilizations
      – Female Infanticide & adoption common
    • Propaganda through education programs & media
  – Rules relaxed in rural areas → 1979
  – Couples can have a second child put pay a “family-planning fee” to cover the government supporting an additional person.
What are some of the limitations, unintended consequences, and contradictions found in government policies toward population growth?
One Child Policy 1979

- rewards start once 1 child contract is signed

Rewards

- free medical care
- free daycare and schooling
- guaranteed job for child
- bonuses for parents
- extra maternity leave
- better housing
- bigger old age pension

Penalties

- must repay financial benefits
- educational, medical benefits, & guaranteed jobs are withdrawn
- parents’ wages reduced
Thomas Malthus wrote that world’s population was increasing faster than the food supplies needed to sustain it.

  - Malthus coined the term “overpopulation”

Claims made by Malthus
- People need food to survive
- People have the natural desire to reproduce
MALTHUS ON OVERPOPULATION

• Population grows exponentially (geometrically)
  – Grows because once children are born, they have children of their own

• Food production grows linearly (arithmetic)
  – Food grows at linear rate → farmland is limited
  – What kind of farming would be around in 1798? ______________

• Food supply will be able to keep up with a growing population only through:
  – “Negative checks”
    • Famine, disease, and war → keep the population contained
    • “Moral restraint” may be negative check
In 1798, **Thomas Malthus** (an economist) wrote an essay titled ‘the Principle of Population growth as it Affects the Future Improvement of Society’

He argued that population growth is exponential \(1,2,4,8,16,32...\) whereas food supply growth is arithmetic \(1,2,3,4,5,6...\). As a result, a crisis point would be reached where famine would result unless population growth is controlled.

In the 19th century, Malthus’s predictions did not come true as the industrial revolution led to an agricultural revolution which resulted in significant increases in food production which kept pace with rapid population growth.

Today, **neo-Malthusians** such as the **Club of Rome** still believe that his ideas are valid. They validate their ideas by quoting evidence such as 1/3 of the world’s population lacking food security, famines in Ethiopia, wars over agricultural lands in Sudan, increasing scarcity of clean water, urbanisation destroying farm land and climate change resulting in desertification.
Population Increase - Geometric / Exponential Growth

Food Supply - Arithmetic / Linear Growth

Excess population growth → Resource depletion, Pollution, Overcrowding, Unemployment → Starvation, Disease, Crime, Misery → War

Hunger beyond this point?
Carrying Capacity

Limiting factors in nature, such as food resources, stay constant in nature, or grow arithmetically.

When the carrying capacity is reached limiting factors in populations begin to take place. A population cannot exceed the carrying capacity without ramification.

Populations Grow Geometrically
Contemporary Neo-Malthusians

Made similar argument about the ability of the earth to sustainably provide resources for an increasing growing population

1. Malthus failed to anticipate only poor countries have rapid population growth  
   - Neo-Malthusians - concerned with population increase

2. World population growth is outstripping a variety of resources
MALTHUS CRITICS

1. PESSIMISTIC BELIEFS
   - World’s supply of resources is fixed rather than expanding.
   - Concern over many resources, not just food.

2. POPULATION GROWTH
   – Larger population could stimulate economic growth & produce more food

   - World possesses sufficient resources to eliminate global hunger & poverty, if shared equally.
Reasons why Malthus is considered wrong

1. FOOD PRODUCTION expanded at a more rapid rate than the world’s population
   - Because of:
     - better growing techniques, higher-yielding seeds, & cultivation of more land
   - Problems with distribution because of:
     - distribution of wealth & insufficient global production of food

2. Malthus was INACCURATE with his POPULATION EQUATION
   - Population did not quadruple as predicted

3. Legitimate concern with resources in our future.

Malthus vs. Actual Trends

Fig. 2-20: Malthus predicted population would grow faster than food production, but food production actually expanded faster than population in the 2nd half of the 20th century.