iRAT
- This is a closed-book, no notes test!
- You have 10 minutes to complete the test.
- Circle the correct answers to each question on the answer sheet provided.
- Also record your answers on the question sheet.
- When you are done, turn over your paper to signal that you have finished.
- Turn in the answer sheet.

"Missed" questions?
Does any team want to appeal?

World Population Growth Through History

What do you think is the most important reason for population growth?
A) Higher birth rate
B) Lower death rate
C) Massive immigration
Why Was Early Growth Slow?
- During the hunting-gathering phase, life expectancy was very low (~ 20 years).
  - High mortality
  - More than half of children born died before age 5.
  - The average woman who survived to the reproductive years would have to bear nearly 7 children to assure 2 survived to adulthood.

Why Are More Recent Increases So Rapid?
- Acceleration in population after 1750 was due to declines in the death rate during the Industrial Revolution.
  - Higher standard of living
  - Better food, cleaner water, sanitation system, public health system ...
- Post-WWII rapid population growth in LDCs
- Import of medical technology from MDCs
- Continuing population increases are due to dramatic declines in mortality without a commensurate decline in fertility (even though fertility IS declining).

Birth and Death Rates, Worldwide

Fertility is declining, but there are more reproductive women
It’s certain world population will continue to grow

79 Million People Are Added to the World’s Population Each Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Population in billions</th>
<th>Annual rate of growth</th>
<th>Annual increase in millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1804</td>
<td>1</td>
<td>0.4</td>
<td>4</td>
</tr>
<tr>
<td>1927</td>
<td>2</td>
<td>1.1</td>
<td>18</td>
</tr>
<tr>
<td>1960</td>
<td>3</td>
<td>1.3</td>
<td>52</td>
</tr>
<tr>
<td>1974</td>
<td>4</td>
<td>2.0</td>
<td>75</td>
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<td>1987</td>
<td>5</td>
<td>1.6</td>
<td>81</td>
</tr>
<tr>
<td>1999</td>
<td>6</td>
<td>1.4</td>
<td>80</td>
</tr>
<tr>
<td>2011</td>
<td>7</td>
<td>1.2</td>
<td>79</td>
</tr>
<tr>
<td>2025</td>
<td>8</td>
<td>0.9</td>
<td>67</td>
</tr>
<tr>
<td>2045</td>
<td>9</td>
<td>0.4</td>
<td>39</td>
</tr>
</tbody>
</table>

Doubling Time

- “Rule of 69“:
  - DT=69/growth rate in percentage
  - DT=ln2/growth rate as a decimal
  - \(69/1.2=57.5\)
  - Does this mean that the population WILL double in 58 years? Why or why not?

- In general, doubling time has declined over time, but recently has been increasing

Team Activity

- Doubling time: the time required for a population to double in number if the current rate of growth continues
- In 2011, the growth rate for the world population was 1.2%, what is the doubling time?
  - A) 18 years
  - B) 25 years
  - C) 37 years
  - D) 58 years
  - E) 75 years
Carrying Capacity
- Refers to the number of people that can theoretically be supported in an area given the available physical resources and the way that people use those resources.
- Change over time, space and culture
- Extensive vs. intensive use of resources
- Short-term vs. long-term

Team Activity
- Is carrying capacity larger in the U.S. than China?
  - A) Yes
  - B) No
  - Why?

Team Activity
- With 7.5 Billion population, have we overshot the carrying capacity of the earth?
  - A) Yes
  - B) No

Geographic Perspective
- Population geographers:
  - Where (location)? How (spatial process)?
  - What is the pattern of population distribution?
  - What are the causes (why) and consequences of such population distribution?

Team Activity
- What are the most important characteristics of world population?
  - List top 3
  - Write on board
World Population

- Uneven distribution
  - Five countries, 49% population, 21% land
  - China + India: 42% pop

World’s 10 Most Populous Countries: 59% of world population

1. People’s Republic of China
2. India
3. United States
4. Indonesia
5. Brazil
6. Pakistan
7. Bangladesh
8. Nigeria
9. Russia
10. Japan

Cartogram of Countries of the World by Population Size

Table 1.4: The Thirty Most Populous Countries in the World, 1990, 2000, and 2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>China</td>
<td>1,080,000,000</td>
<td>1,260,000,000</td>
<td>1,340,000,000</td>
</tr>
<tr>
<td>2</td>
<td>India</td>
<td>1,010,000,000</td>
<td>1,010,000,000</td>
<td>1,010,000,000</td>
</tr>
<tr>
<td>3</td>
<td>United States</td>
<td>275,000,000</td>
<td>280,000,000</td>
<td>280,000,000</td>
</tr>
<tr>
<td>4</td>
<td>Brazil</td>
<td>175,000,000</td>
<td>180,000,000</td>
<td>180,000,000</td>
</tr>
<tr>
<td>5</td>
<td>Russia</td>
<td>145,000,000</td>
<td>145,000,000</td>
<td>145,000,000</td>
</tr>
<tr>
<td>6</td>
<td>Japan</td>
<td>125,000,000</td>
<td>125,000,000</td>
<td>125,000,000</td>
</tr>
<tr>
<td>7</td>
<td>Pakistan</td>
<td>115,000,000</td>
<td>115,000,000</td>
<td>115,000,000</td>
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<tr>
<td>8</td>
<td>Egypt</td>
<td>85,000,000</td>
<td>86,000,000</td>
<td>87,000,000</td>
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<tr>
<td>9</td>
<td>Brazil</td>
<td>82,000,000</td>
<td>83,000,000</td>
<td>84,000,000</td>
</tr>
<tr>
<td>10</td>
<td>India</td>
<td>81,000,000</td>
<td>82,000,000</td>
<td>83,000,000</td>
</tr>
<tr>
<td>11</td>
<td>Indonesia</td>
<td>78,000,000</td>
<td>79,000,000</td>
<td>80,000,000</td>
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<tr>
<td>12</td>
<td>Nigeria</td>
<td>77,000,000</td>
<td>78,000,000</td>
<td>79,000,000</td>
</tr>
<tr>
<td>13</td>
<td>Bangladesh</td>
<td>75,000,000</td>
<td>76,000,000</td>
<td>77,000,000</td>
</tr>
<tr>
<td>14</td>
<td>Russia</td>
<td>74,000,000</td>
<td>75,000,000</td>
<td>76,000,000</td>
</tr>
<tr>
<td>15</td>
<td>Pakistan</td>
<td>73,000,000</td>
<td>74,000,000</td>
<td>75,000,000</td>
</tr>
<tr>
<td>16</td>
<td>Egypt</td>
<td>72,000,000</td>
<td>73,000,000</td>
<td>74,000,000</td>
</tr>
<tr>
<td>17</td>
<td>India</td>
<td>71,000,000</td>
<td>72,000,000</td>
<td>73,000,000</td>
</tr>
<tr>
<td>18</td>
<td>Brazil</td>
<td>70,000,000</td>
<td>71,000,000</td>
<td>72,000,000</td>
</tr>
<tr>
<td>19</td>
<td>India</td>
<td>69,000,000</td>
<td>70,000,000</td>
<td>71,000,000</td>
</tr>
<tr>
<td>20</td>
<td>China</td>
<td>68,000,000</td>
<td>69,000,000</td>
<td>70,000,000</td>
</tr>
</tbody>
</table>

World Population by Region at the Turn of Three Centuries: 1800, 1900, and 2000

Population in millions

<table>
<thead>
<tr>
<th>Region of the World</th>
<th>1800</th>
<th>1900</th>
<th>2000</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>19</td>
<td>30</td>
<td>100</td>
<td>16.2</td>
</tr>
<tr>
<td>India/Bangladesh</td>
<td>87</td>
<td>344</td>
<td>967</td>
<td>7.9</td>
</tr>
<tr>
<td>Japan</td>
<td>2.5</td>
<td>3.5</td>
<td>30</td>
<td>0.4</td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>42</td>
<td>52</td>
<td>75</td>
<td>6.2</td>
</tr>
<tr>
<td>Europe</td>
<td>122</td>
<td>209</td>
<td>740</td>
<td>10.0</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>36</td>
<td>133</td>
<td>647</td>
<td>8.6</td>
</tr>
<tr>
<td>Asia</td>
<td>856</td>
<td>3182</td>
<td>4437</td>
<td>59.8</td>
</tr>
<tr>
<td>Oceania</td>
<td>1</td>
<td>5</td>
<td>23</td>
<td>0.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1100</td>
<td>3024</td>
<td>7417</td>
<td>100</td>
</tr>
</tbody>
</table>


Geographic Distribution

- Uneven distribution
- Uneven growth rates
  - World average 1.2% per year in 2011
  - Five of the top ten countries are growing more rapidly than the average:
    - Nigeria, Pakistan, Bangladesh, India, Indonesia
  - Five are growing slower:
    - Russia, Japan, China, US, Brazil

Population growth

Average growth rate, %, 1995 – 2000

<table>
<thead>
<tr>
<th>Key</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0-0.9</td>
</tr>
<tr>
<td>1</td>
<td>1-1.9</td>
</tr>
<tr>
<td>2</td>
<td>2-2.9</td>
</tr>
<tr>
<td>3</td>
<td>3-3.5</td>
</tr>
<tr>
<td>4</td>
<td>&gt;3.5</td>
</tr>
</tbody>
</table>

Figure 3.1 Rates of Population Growth are Highest in the Middle East

As shown in the map, the Middle East has the highest rates of population growth, with some countries exceeding 3.5% per year. In contrast, regions such as Europe and Oceania have much lower growth rates, typically below 1%. This uneven distribution of growth rates is a key factor contributing to global demographic shifts.
Projected Population Change

Percent Population Change, 2005-2050


Geographic Distribution

- Uneven distribution
- Uneven growth rates
- Developing vs. developed regions
  - Four out of five most populous countries are LDCs: China, India, Brazil, Indonesia
  - Growth rate is generally higher in LDCs

Global population growth:
A developing country phenomenon

The “Future” is in Developing Regions!

<table>
<thead>
<tr>
<th>Area</th>
<th>More Developed Nations</th>
<th>Less Developed Nations</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population in 2000 (in millions)</td>
<td>1,181</td>
<td>6,909</td>
<td>6,681</td>
</tr>
<tr>
<td>Projection to year 2025 (in millions)</td>
<td>1,213</td>
<td>6,692</td>
<td>7,905</td>
</tr>
<tr>
<td>Increase between 2000 and 2025 (in millions)</td>
<td>32</td>
<td>1,792</td>
<td>1,424</td>
</tr>
<tr>
<td>Percent of increase attributable to each area</td>
<td>2%</td>
<td>98%</td>
<td></td>
</tr>
</tbody>
</table>


North-South Divide

Total Fertility Rate
In 2000
- 1.50 - 1.49
- 1.50 - 2.05
- 2.06 - 2.49
- 2.50 - 2.99
- 3.00 - 3.49
- 3.50 - 3.99
- 4.00 - 7.00
South-North Divide
- The south has higher birth rates, higher death rates, and younger populations than the north.
- These differences, and the variability within the south in these differences, will drive the future.

Geographic Distribution
- Uneven distribution
- Uneven growth rates
- Developing vs. developed regions
- Increasingly urban

The Urban Revolution
- As population grew dense in a region, people used to move to a less populated area, now they move to urban areas.
- As recently as 1800, less than 1% of the world's population lived in cities of 100,000 or more.
- More than 1/3 of all humans now live in cities of that size, and more than half live in urban places of any size.
- Urban populations grew in some countries even without industrialization, as places sprang up where goods and services were exchanged.
- "the second wave of urban revolution" in LDCs
### Largest Cities

#### Table 2. Population of cities with 10 million inhabitants or more, 1990, 1995, 2000 and 2010 (in millions)

<table>
<thead>
<tr>
<th>Rank</th>
<th>City</th>
<th>1990</th>
<th>1995</th>
<th>2000</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>New York</td>
<td>13.1</td>
<td>13.0</td>
<td>13.0</td>
<td>13.0</td>
</tr>
<tr>
<td>2</td>
<td>Tokyo</td>
<td>12.8</td>
<td>12.6</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>3</td>
<td>Mexico City</td>
<td>11.6</td>
<td>11.5</td>
<td>11.5</td>
<td>11.5</td>
</tr>
<tr>
<td>4</td>
<td>Shanghai</td>
<td>11.4</td>
<td>11.3</td>
<td>11.3</td>
<td>11.3</td>
</tr>
<tr>
<td>5</td>
<td>Beijing</td>
<td>10.8</td>
<td>10.7</td>
<td>10.7</td>
<td>10.7</td>
</tr>
<tr>
<td>6</td>
<td>Osaka</td>
<td>10.3</td>
<td>10.2</td>
<td>10.2</td>
<td>10.2</td>
</tr>
<tr>
<td>7</td>
<td>Moscow</td>
<td>10.1</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
</tr>
<tr>
<td>8</td>
<td>São Paulo</td>
<td>9.7</td>
<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
</tr>
<tr>
<td>9</td>
<td>São Paulo</td>
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</tr>
<tr>
<td>10</td>
<td>São Paulo</td>
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</tr>
<tr>
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<td>São Paulo</td>
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<tr>
<td>13</td>
<td>São Paulo</td>
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<tr>
<td>14</td>
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<td>16</td>
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<tr>
<td>17</td>
<td>São Paulo</td>
<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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</tr>
<tr>
<td>18</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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<tr>
<td>19</td>
<td>São Paulo</td>
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<tr>
<td>20</td>
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<td>21</td>
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<td>9.6</td>
<td>9.6</td>
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<tr>
<td>22</td>
<td>São Paulo</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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<tr>
<td>23</td>
<td>São Paulo</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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<tr>
<td>24</td>
<td>São Paulo</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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<tr>
<td>25</td>
<td>São Paulo</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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<tr>
<td>26</td>
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<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
</tr>
<tr>
<td>27</td>
<td>São Paulo</td>
<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
</tr>
</tbody>
</table>

#### Figures

- Figure 15: Percentage of population urban in 1950
- Figure 16: Percentage of population urban in 1960
- Figure 17: Percentage of population urban in 1970
- Figure 18: Percentage of population urban in 1980
- Figure 19: Percentage of population urban in 1985
- Figure 20: Percentage of population urban in 1990
- Figure 21: Percentage of population urban in 1995
- Figure 22: Percentage of population urban in 2000
- Figure 23: Percentage of population urban in 2010
- Figure 24: Percentage of population urban in 2015
- Figure 25: Percentage of population urban in 2020
Due to unevenness in population distribution, migration has been the most important dynamics to adjust the spatial distribution of population. Please draw major migration streams in history on the world map.

Geographic Distribution

- Redistribution through migration
  - From rapidly growing areas into less rapidly growing areas
  - From developing countries to developed countries
  - From rural to urban areas
Redistribution of the World’s Population through Migration

- European expansion (14th to 20th centuries)
  - Europe to North and South America
  - Africa to Latin America, Caribbean and North America
- South to North migration (20th & 21st centuries)
  - Latin America and Asia to the United States
  - Asia to Canada
  - Africa and Asia to Europe

Judith Blake “population growth used to be a reward for doing well; now it’s a scourge for doing badly.”

But the latest projection by PRB:
- more migration between developing countries in the future (south-south migration)

Foreign-Born Populations Are Generally Rising in the Industrialized World …

Percent of population foreign-born, Canada, Ireland, and Spain, 1950-2005

… But Foreign-Born Populations Are Also Rising in the Developing World.

Percent of population foreign-born, Gabon and Malaysia, 1960-2005

The rapid urbanization especially in LDCs indicates massive internal migration.
Population Distribution

- Uneven distribution
- Uneven growth rates
- Developing vs. developed regions
  - North vs. south contrast
- Increasingly urban, more mega cities
- Massive migration/immigration

Team Activity

- In 2050, most of you will be around 55-60 years old. What kind of world would you be living in 2050?
  - List top 3 main characteristics
  - Write on the board

Global Population in 2050

- 9.7 Billion
- Getting older: 1.5 Billion 65+

Percentage change in population

- Estimated percent change in population,按年計, by age, in the world and the U.S.

- More developed regions have relatively high proportions of older persons.
Global Population in 2050

- 9.7 Billion
- Getting older: 1.5 Billion 65+
- Population shift to Africa

Global Population in 2050
- 9.7 Billion
- Getting older: 1.5 Billion 65+
- Population shift to Africa
- India becomes the largest population
- Population losers: Japan, Russia, Germany (>10%)

Demographic Data
- Data is the cornerstone of demographic and population analyses
- Types of data:
  - Primary
  - Secondary

Team Activity
Which of the following would not be a typical source of demographic data?
A) National archives
B) Censuses of population
C) Birth registration data
D) School enrollment
E) A national household survey

Sources of Demographic Data
- Census
- Registration of vital events – vital statistics:
  - Birth, death, marriage, divorce, and incidence of certain infectious diseases
- Administrative data
  - e.g. USCIS, IRS, DMV, school enrollment, utility companies
- Sample survey
  - To address a specific question
  - To address theoretical concerns; “why”
  - CPS, ACS, AHS, PSID, WFS
Sources of Demographic Data

- **Census**
  - The UN definition: “the total process of collecting, compiling and publishing demographic, economic and social data pertaining, at a specific time or times, to all persons in a country or delimited territory”
  - Goals: Taxation, distribution of military obligations, determination of political status, allocation of welfare, resources, ...keep tract of the population

Census of the U.S.

- Every 10 years since 1790
- 1902: the Census Bureau
- Information: demographic, housing; concerns of the time
- Long vs. short form
  - 1/6 of population get the long form

- **2010 Census**
  - Replacing long-form with American Community Survey (ACS) in 2010
  - Conducted every year (1996-), 0.5 --> 2 M
  - Age, sex, race, family and relationships, income and benefits, health insurance, education, veteran status, disabilities, where you work and how you get there, where you live and how much you pay for some essentials
Team Activity

A census based on the *de jure* population counts
A) all people who are present in a given territory on census day.
B) all people who are living in a given territory.
C) only immigrants and their children.
D) Only natural born citizens
E) None of the above

Limitations of/Errors in the Census

- Very expensive, often every 10 years
- Different countries at different times
- Sampling error
- Nonsampling error
  - Content error
  - Coverage error
  - Undercount

Table 2.2: Net Undercount and Differential Undercount in U.S. Censuses

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Undercount for Total Population (%)</th>
<th>Net Undercount of Black Population (%)</th>
<th>Net Undercount of White Population (%)</th>
<th>Differential Undercount (percentage point difference between black and white undercount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>5.6</td>
<td>10.3</td>
<td>5.1</td>
<td>5.2</td>
</tr>
<tr>
<td>1950</td>
<td>4.4</td>
<td>9.6</td>
<td>3.8</td>
<td>5.8</td>
</tr>
<tr>
<td>1960</td>
<td>3.0</td>
<td>0.9</td>
<td>2.9</td>
<td>0.6</td>
</tr>
<tr>
<td>1970</td>
<td>2.9</td>
<td>8.0</td>
<td>2.2</td>
<td>5.8</td>
</tr>
<tr>
<td>1980</td>
<td>1.4</td>
<td>5.9</td>
<td>0.7</td>
<td>5.2</td>
</tr>
<tr>
<td>1990</td>
<td>1.6</td>
<td>4.6</td>
<td>0.7</td>
<td>3.9</td>
</tr>
<tr>
<td>2000</td>
<td>1.2</td>
<td>2.2</td>
<td>0.7</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Sources: Data for 1940 through 1980 are from Anderson and Feenberg (1999: Table 4.1); and data for 1990 and 2000 are from U.S. Census Bureau (2010: Table 1). The figures for 2000 represent the mean of the high and low estimates produced by the Census Bureau.

Undercount in 2010 census

- Overall: 1.1% for renters (homeowners over counted by 0.6%)
- Blacks: 2.1%
- Hispanics: 1.5%
- American Indians and Alaska natives living on reservations: 4.9%

Team Activity: Why is undercount a problem?

- Missing individuals are disproportionately minorities
- Why should we care?
Data Sources

- U.S. Census Bureau
- Population Reference Bureau (PRB)
- World Population Data Sheet
- Population Institution
- United Nations Population Fund
- Statistical Abstract of the United States
- Demographic Yearbook by the Unite Nations
- Data centers
  - Michigan Census Research Data Center
  - ICPSR (Inter-university Consortium for Political and Social Research)
- Journals/books
- ...

Re-cap

- World population in time and space
- Main characteristics of world population
- Demographic data sources, issues