

METHOD

Students interpret UN population projections and visually model regional population changes from 1800 to 2100, before researching challenges to population stabilization in high-growth areas and organizations addressing them on the ground.

INTRODUCTION

The global population, currently made up of 8 billion people, continues to grow by tens of millions of people each year. Even though the overall growth rate has slowed in recent decades, demographers expect population to grow into the later part of this century.

Current projections for 2100 range from a low of 8.9 billion to a high of 12.4 billion (UN Projections, 2022). This trajectory of growth will be determined largely by fertility trends in different parts of the globe, so demographers closely track the factors that may impact family size decisions. There are, of course, limits to population growth, such as the resources needed to meet human needs. Only a sustainable balance of people and resources will enable a decent quality of life for humanity in the coming decades.

Vocabulary: fertility rate, least developed countries

MATERIALS

Part 1

- None

Part 2

- 5 paper plates
- Counting Cards (provided)

Part 3

- Assignment Sheet (provided)

CONCEPT

The world's population is expected to grow through mid-century and reach over 10 billion by 2100, with the majority of growth in the least developed countries. Factors that affect fertility decisions will determine the future of global population.

OBJECTIVES

Students will be able to:

- Describe and interpret the UN's global population projection graph.
- Explain how small changes in current fertility rates can significantly impact future population size.
- Describe global and regional population growth patterns over 300 years, from 1800 through the projected growth for 2100.
- Identify the challenges to stabilizing global population.
- Research successful programs working to tackle population-related challenges.

SUBJECTS

AP Human Geography, Geography, World History (General and AP), Environmental Science (General and AP), Government

SKILLS

Interpreting line graphs, reading comprehension, comparing and evaluating data, synthesizing research, writing

PART 1

Interpreting Population Projections

The United Nations Population Division releases population estimates and projections in *World Population Prospects*, a biannual report on country and world demography utilizing the most available and current data. The most recent report is *The 2022 Revision*.

Procedure:

1. Display the [UN World Population Projections graph](#) and give students time to consider it independently. Explain to students that the solid, red graph line shows the UN's median variant projection for population to 2100. The dashed blue lines show how this projection changes widely with a change in the **fertility rate** (the number of children a woman has on average) of just 0.5 children more or less than what is currently expected.
2. Students now read "[Projecting Global Population to 2050 and Beyond](#)" from the World Population History site.
3. Return to the displayed World Population Projections graph and go over the three projections: median variant projection; 80% prediction interval; 95% prediction interval. Explain that the prediction interval refers to how certain demographers are on the range of numbers. So, for the 95% prediction interval, demographers consider there to be a 95 percent chance that world population will be within that range.

Discussion Questions:

1. What are the lower and upper limits on the range of projections for global population in the year 2100, in the 95% prediction interval?

From a low of 8.9 billion to a high of 12.4 billion.

2. What are the lower and upper limits on the range of projections for global population in the year 2100, in the 80% prediction interval?

From a low of 9.3 billion to a high of 11.7 billion.

3. Is the population expected to peak before 2100 in each of the projections?

No. The population is expected to peak prior to 2100 in the low end of the range for the 80% and 95% prediction intervals, and for the median prediction. However, the high end of the range for the 80% and 95% prediction intervals shows continued growth.

4. Do you think it is important that multiple projections are given? Why or why not?

Answers will vary.

5. The UN's projection is based on projected trends in fertility. What might cause fertility rates to increase or decrease?

Possible answers include: changes in cultural norms and gender roles; more education and employment opportunities for girls/women; economic trends; contraceptive use, child survival rates, healthcare access.

6. What other factors, besides those that affect fertility rates, impact future population trends?

Factors that affect mortality rates would also impact future population. Possible answers include: pandemics; wars; malnourishment; poor sanitation; environmental pollution and other public health crises.

PART 2

Population Growth by Region: 1800-2100

The median variant suggests that demographers expect more than 2 billion people to be added to the planet by the end of the century. They do not, however, expect these people to be distributed evenly among world regions.

1. Before class, cut out the Counting Cards. Label each paper plate as one world region and outline it with the color found on that region's Counting Card: Africa (green), Asia (red), Europe (brown), Latin America (blue), and Northern America (orange).

2. Arrange the paper plates on a table or set of desks. Identify each region by name for the class.

NOTE: The regions in this simulation are those defined by the United Nations and, therefore, Mexico is included in Latin America and Russia is part of Europe. The sixth world region, Oceania, is not included because its population is so small relative to the others that it cannot be accurately represented.

3. Distribute the 44 Counting Cards (many students will get two cards). Each card represents 250 million people. Have students gather around the table/desks where you have placed the labeled paper plates.

4. Explain that you will all be traveling through time from 1800 to 2100 to see how population has grown, and will grow, during that 300 year period. The time travel will be represented by counting from 1 to 100 and with every number said, 3 years will pass. So when the group reaches 100, all 300 years will have passed and you will be in the year 2100.

5. Students should take note of the number on their card(s) and if they have more than one, order them smallest to largest. With one exception, when a card's number is reached, that student should place the card onto the plate indicated by the world region listed on the card. The additional card on the plate represents an increase in the region's population. The exception is card 94, which should not be added to a plate. Instead, the student with this card will REMOVE a Counting Card from Europe when counting reaches 94.

NOTE: It is important that students understand that the numbers on the cards are for counting purposes only and do not represent population numbers; the card itself represents the population. If you think it would be helpful, draw a large X on the back of each card (so the white card stands out against the white plate) and ask students to place their cards face down on the paper plate so the number is hidden.

6. Ask the four students with the number “0” on their cards to place these cards on the respective plates to begin the simulation (three will be on the Asia plate and one on the Europe plate). Explain that these cards represent the global population in the year 1800 when global population first reached 1 billion. While people lived in every region in 1800, Asia and Europe were the predominant population centers at the time.
7. As a group, start counting at a comfortable pace. **Stop when you reach 74.** The number 74 most closely corresponds to present-day (2022).
8. Have the students share observations about the population distribution in 2022. You can guide them with the following questions: *What is the global population? What region is most populated? What region is growing the fastest? The slowest?*
9. Continue counting to 100.
10. With the simulation completed, again have the students share observations about the population distribution in 2100 and go over the Discussion Questions.

Discussion Questions:

1. What is the total projected global population in 2100?

Based on the simulation, the total global population in 2100 is projected to be about 10.5 billion. (42 cards x 250 million per card = 10.5 billion). The UN's projection for 2100 is 10.4 billion people.

2. By the end of the simulation, which two regions are the most populated? What are those regions' projected populations in 2100?

Asia is the most populated with 20 cards representing 5 billion people. This is followed by Africa, with 15 cards representing 3.75 billion people.

3. Which region is growing the fastest and will add the most population from now until the 2100?

Africa. The continent is expected to add about 2.5 billion people by the end of the century. Most of this growth is in sub-Saharan African countries.

4. Of the 46 countries that the UN categorizes as “least developed,” 33 of them are in Africa. **Least developed countries** are those that meet certain thresholds for poverty, economic vulnerability, and low levels of nutrition, education, adult literacy, and health. What are some of the challenges for these countries experiencing the greatest future population growth?

Least developed countries lack the infrastructure to provide for a rapidly growing population including employment, transportation, education, healthcare facilities, energy, housing, clean water, and improved sanitation. In addition, they may lack the ability to grow or import adequate food supplies.

PART 3

Working Toward a Stable Population

Depending on how population grows until the end of the century and how big our global family becomes, life in 2100 could be dramatically different. But projections are not set in stone and what happens today can impact that future.

Procedure:

1. Lead a discussion on how students think the world in 2100 would be different depending on the size of the global population. If needed, prompt them to consider issues of natural resource use, environmental conditions, civil society, and human health and well-being.
2. Have students recall what they learned in Part 1, specifically that fertility rate is the primary driver of population growth trends and that several factors influence fertility rate (gender roles, education, economics, reproductive health including contraceptive use, child survival).
3. Now have students recall what they learned in the simulation with the counting cards in Part 2, specifically that the majority of future population growth is expected to be in Africa, in the least developed countries.
4. Distribute the Student Assignment sheet. Explain to students that they will be researching organizations and/or agencies working to improve conditions in the least developed countries. Such improvements could, in turn, affect fertility rates. The assignment involves Internet research and writing. For some ideas on effective NGOs working on change for women, see the [list of Community Organizations](#) provided by Empower Women, a joint venture between UN Women and Canada.

ASSESSMENT

Write a short paragraph describing how population is projected to grow from now to 2100 and identify one factor that could change the projected population size. Assess students' assignments based on how well the student explained their selected organization, the work it does to lower fertility rates, and the impacts it has had.

WHERE DO WE GROW FROM HERE? COUNTING CARDS

ASIA 0 (1800)	ASIA 0 (1800)	ASIA 0 (1800)	EUROPE 0 (1800)	ASIA 18 (1854)
EUROPE 30 (1890)	AFRICA 37 (1911)	ASIA 43 (1929)	ASIA 47 (1941)	LATIN AM. 50 (1950)
NORTHERN AM. 52 (1956)	ASIA 53 (1959)	EUROPE 55 (1965)	ASIA 56 (1968)	ASIA 57 (1971)
ASIA 58 (1974)	AFRICA 59 (1977)	ASIA 60 (1980)	LATIN AM. 61 (1983)	ASIA 62 (1986)
ASIA 63 (1989)	AFRICA 64 (1992)	ASIA 65 (1995)	ASIA 66 (1998)	AFRICA 67 (2001)

WHERE DO WE GROW FROM HERE? COUNTING CARDS

<p>ASIA 68 (2004)</p>	<p>ASIA 69 (2007)</p>	<p>ASIA 70 (2010)</p>	<p>LATIN AM. 71 (2013)</p>	<p>AFRICA 72 (2016)</p>
<p>ASIA 73 (2019)</p>	<p>AFRICA 74 (2022)</p>	<p>ASIA 75 (2025)</p>	<p>AFRICA 76 (2028)</p>	<p>NORTHERN AM. 78 (2034)</p>
<p>AFRICA 79 (2037)</p>	<p>AFRICA 80 (2040)</p>	<p>AFRICA 82 (2046)</p>	<p>AFRICA 84 (2052)</p>	<p>AFRICA 86 (2058)</p>
<p>AFRICA 89 (2067)</p>	<p>REMOVE card from EUROPE 94 (2082)</p>	<p>AFRICA 95 (2085)</p>	<p>AFRICA 97 (2091)</p>	

Background

The UN Population Projections show a large range for how global population will grow through the end of the century. Much of the uncertainty is related to the fertility rate – how many children women have on average. Around the globe, fertility rate varies widely from a low of 0.9 (South Korea) to a high of 6.8 (Niger). The global average is 2.3. The highest fertility rates are in the poorest countries. In many cases, women wish to better plan the number and spacing of their children but do not have the means (contraceptives, reproductive healthcare, or education). In other cases, high fertility is encouraged because cultural norms dictate that women are valued only for childbearing and rearing. The global population will only stabilize when the global fertility rate reaches replacement level (2.1) fertility.

A number of government agencies and non-governmental organizations around the world are working to address the challenges that keep fertility rates high in the least developed countries of the world. Some of these work to provide schooling for girls, as a means of providing them with an education and future opportunities. Others work to provide family planning or healthcare to reduce child mortality. Still others work on improving clean water and sanitation.

Assignment

Research an organization working on alleviating one of the challenges that face people in the least developed countries and that can affect population growth. This could be a non-governmental organization, a government or international agency, or a philanthropic foundation.

In 3-5 paragraphs, write a description of the organization's work and your conclusions regarding its ability to affect population growth. Be sure to answer the following questions within the body of your written assignment.

- In what countries does the organization have programs?
- What is the average fertility rate of these countries? (Hint: Use the map at www.WorldPopulationHistory.org to find country-specific fertility rates from 2015. Turn on the Fertility Rates Overlay and mouse over necessary countries.)
- Who does the organization serve (what is their target audience)?
- How is the organization funded?
- How long has the organization been working on this challenge?
- How does the organization measure success?
- What are some examples of the organization's accomplishments?
- Do you think this organization's work effectively impacts fertility rates in the region? Explain. Do you think this organization's work could be replicated in other places? If yes, do you think it should be replicated?