**METHOD**

Students explore and discuss the United Nations’ population projections to learn how small changes in the fertility rate can produce significantly different results in terms of total population. Students then model population growth projections from 1800 to 2100 to see where in the world population growth has and will be occurring. Finally, students explore challenges to population stabilization in areas of high growth and research organizations with successful strategies for addressing these challenges.

**INTRODUCTION**

The global population, currently made up of 7.5 billion people, continues to grow by more than 80 million people each year. Even though the overall growth rate has slowed in recent decades, demographers expect population to grow through this century. Current projections for 2100 range from a low of 9.6 billion to a high of 13.2 billion (UN Projections, 2017). 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.

Parts 1 and 2 are in-class activities. Part 3 is an in-class discussion and out of class writing assignment.

**MATERIALS**

- Website: [www.WorldPopulationHistory.org](http://www.WorldPopulationHistory.org)
- 5 paper plates
- Population Projection counting cards
- Student Assignment sheet

**CONCEPT**

The world’s population is expected to grow through mid-century and possibly top 11 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:

- Explain and interpret the UN’s global population projection graph.
- Recognize the growth patterns, both globally and regionally, of human population over the course of 300 years, beginning in 1800 and following the projected growth to 2100.
- Identify the challenges to stabilizing global population sooner than projected.
- Research successful programs working to tackle population-related challenges.

**SUBJECTS**

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

**SKILLS**

Reading and interpreting graphs, analyzing data, applying academic knowledge to real world events, making and justifying conclusions, research, writing a short paper.
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 2017 Revision*.  

Procedure:  
1. Display the interactive UN World Population Projections graph from www.WorldPopulationHistory.org. Explain to students that the graph line shows the UN’s Medium variant projection for population to 2100. You can move the scale at the bottom to show how this projection changes with a change in the fertility rate (the number of children a woman has on average) of just 0.5 children more or less.  
2. Provide students access to www.WorldPopulationHistory.org and have them read “Projecting Global Population to 2050 and Beyond.”  
3. Display the United Nations projections graph from the reading and go over the three projections: Medium variant projection; 80% prediction interval; 95% prediction interval. Explain that the prediction or confidence interval refers to certain demographers are on the range of numbers. So, for the 95% prediction interval, demographers project that there is a 95 percent chance that world population will be within that range.  

Discussion Questions:  
1. What is 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 9.6 billion to a high of 13.2 billion.*  
2. What is the lower and upper limits on the range of projections for global population in the year 2100, in the 80% prediction interval?  

3. Is population expected to rise in each one of the projections?  

No. For the low end of the predictions, population would peak before 2100. In the 95% prediction range, population would peak in 2080 at about 9.8 billion and decline to 9.6 billion by 2100. In the 80% prediction low range, population would peak in 2085 at just over 10 billion. At the upper end of the range, population would continue to grow past 2100.  

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

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 medium variant suggests that demographers expect almost 4 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.  

Preparation, before class:  
1. Label each paper plate as one of the following regions: Africa, Asia, Europe, Latin America and Northern America.
2. Cut out the Population Projection counting cards.

Procedure:
1. 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.

2. Distribute the 45 Population Projection 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.

3. 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 we will be in the year 2100.

4. Students should take note of the number on their card(s) and if they have more than one, order them smallest to largest. 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 to show an increase in the population.

5. 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 students represent the global population in the year 1800 when our population first reached 1 billion. While people lived throughout the globe in 1800, Asia and Europe were the predominant population centers at the time.

6. As a group, start counting at a comfortable pace. Stop when you reach 72. The number “72” corresponds to present-day (2016).

7. Have the students share observations about the population distribution in 2016. 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?

8. Continue counting to 100.

9. 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?

The total global population in 2100 is projected to be about 11.25 billion. (45 cards x 250 million per card = 11.25 billion)

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 17 cards representing 4.25 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 over 3 billion people by the end of the century, a quadrupling of the region’s present population. Most of this growth is in sub-Saharan African countries.

4. Of the 48 countries that the UN categorizes as “least developed,” 34 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. Students 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 in the least developed countries, see the list of Partners at www.halftheskymovement.org.

**ASSESSMENT**

Monitor students’ involvement in the various class discussions covering the UN Projections graph and the regional growth simulation. Collect the completed assignments and assess each based on how well the student explained their selected organization, the work it does to lower fertility rates, and the impacts it has had.