Concept:
Each individual’s decisions about childbearing contribute to population trends. Personal decisions about when to start a family are influenced by the values of the larger society, and one’s personal family-timing decisions, in turn, have an impact on the larger society.

Objectives:
Students will be able to:
- Calculate population size trends and analyze the influence of family timing on these.
- Identify at least two social factors that may influence a teenager’s decision to start a family.

Subjects:
Math, Family & Consumer Sciences, Social Studies, Science, Geography, Health, History

Skills:
Graphing, critical thinking, identifying trends, measuring, drawing to scale

Method:
Students draw models of family populations and use these to identify trends in population size influenced by family timing.

A Matter of Timing

Introduction:
In the United States, 34% of teenage girls get pregnant at least once before reaching the age of 20.¹ This adds up to more than 820,000 teen (ages 15-19) pregnancies and nearly 48 live births per 1,000 teen girls in the U.S. each year.² The national birthrate for women of all ages is much lower: 14 per 1,000 women; the global average is 21 per 1,000. Teenage girls who have children are substantially less likely to graduate from high school, leading to a cascade of other impacts on their lives. A mere 1.5% of teenage mothers earn a college degree by age 30.³

Beyond the impacts on individual girls’ lives, teenage pregnancy affects the larger population by shortening generation lengths, which in turn increases total population size. Imagine a woman who has twins at age 15 and another who waits until she is 30 years old. The 15-year old has created, in effect, an additional generation.

The U.S.’s teen pregnancy rate is much higher than that in most other industrialized nations. In addition, it is 81st in the world, with higher rates of births to teenagers than in the sub-Saharan African nations of Rwanda and Burundi.⁴ A number of factors are related to this, but there is no single cause that can be isolated. A few facts related to teenage pregnancies in the United States are of note:

- 80% of teen pregnancies are unplanned.⁵
- Nearly 80% of teenage mothers eventually end up on welfare.⁶
- 83% of teen mothers were poor before they became pregnant.⁷
- Less than 1/3 of teenagers who have a child before the age of 18 complete a high school education. Only 1.5% of teen mothers complete a bachelor’s degree by the age of 30.⁸

Materials:
Student Worksheets (one per student)
Rulers

Procedure:
1. Have students complete the Student Worksheet.

2. Display the graphed results on a bulletin board, chalkboard, or computer display screen for discussion.

3. Ask students to describe any population trends they see across the different families.
Discussion Questions:
1. What does it mean to have multiple generations alive at one time? How many generations of your family have you met? What role (if any) do these people play in your life?

   Students should reflect upon the role of grandparents or other relatives in their extended families. Non-related family friends could be considered if students do not have older relatives.

2. Most of the facts about teen pregnancy are about mothers, because they are the most directly affected. What are the effects of having a child to a teenaged boy? Why might this not be as significant a demographic factor?

   The Campaign to Prevent Teen Pregnancy has a number of personal statements from both male and female teenaged parents. These can be read at www.teenpregnancy.org/resources/teens/voices/teenrent.asp. Most focus on the hard work involved in parenting, as well as the missed chances to do ‘teenage’ things, such as going to parties and the prom, or just hanging out.

   Demographers measure birth rates in terms of number of births per female because women are the only part of the population that can give birth. In species such as certain trees that have both male and female parts on the same plant, all members of the population are counted in the calculations.

3. Why do you think the United States has such a high rate of teen pregnancy relative to other nations?

   Even the experts can’t agree on the reasons for this disparity. Some possible reasons may include differing attitudes toward teen sexuality, sex education, and teen parenting. U.S. rates relative to other industrialized nations’ can be seen on the 300,000,000 in the USA wall chart available at www.populationeducation.org.

4. What do your findings suggest about length of generation as a means to reduce population growth?

   Waiting until a later age to begin having children would reduce overall population growth.

Notes:
1, 3, 5, 6, 8: Campaign to Prevent Teen Pregnancy. www.teenpregnancy.org/whycare/sowhat.asp


9 Population Reference Bureau. 2005 World Population Data Sheet. Note: the actual average American life expectancy is 78 years. For a more challenging math assignment, use the more precise number. 80 years is used here to make the model simpler.
1. Diagrams will vary for different families.

2. | Family | Age of mother at first birth | Generations alive at one time | Total Population of family |
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<tbody>
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3. The total population is 130 people. Family A is 48% of the total; family B is 24%; family C is 12%; families D – F are each 5%. (These numbers add up to only 99% due to rounding.)

4. ![Graph of population per family over time]

5. The total population of family A with triplets is 374 people after 80 years. With twins, family A had a population of only 63 people after 80 years, or 311 fewer people.
Imagine 6 different families, each of which has perfectly even generation lengths. That is, if a woman in one family is 25 years old when she has her first child, her children will also have their first children at age 25, as will those children’s children. Assume that all individuals in all families have 2 children (To make your model simpler, we’ll pretend all the families have twins. This is highly unlikely in the real world, but makes the model more even.), so the effect of generation length is easy to see. The families (A – F) and their generation lengths (age of mother at first birth) are listed in the table below question 2.

1. Using the template provided, draw a family tree for each of these six families, including only the mothers, their children, and the children of the females of each generation. Each decade is represented by 1 inch of vertical space.

For example:

Note that the family tree does not include spouses, just the children of the original mother, and her children. If we included the fathers of all the children, the population would be even larger!
2. The average life expectancy of an American (male or female) is approximately 80 years. Cut out a rectangular frame from a sheet of paper that so the inside of the cutout is 8 inches long (1 inch = 10 years; 8 inches represents 80 years) and as wide as your family trees. Lay this over each of the family trees. The space inside the ‘frame’ represents the number of family members alive at any one time.

How many generations are alive for each family?

What is the total population of the family? (When you are making these assessments, don’t forget to include the youngest generation of newborns.)

Write these numbers in the table below.

<table>
<thead>
<tr>
<th>Family</th>
<th>Age of mother at first birth</th>
<th>Generations alive at one time</th>
<th>Total Population of family</th>
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<tbody>
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3. What is the total number of people in all the families after 80 years (total population)? What percent of this total population comes from each family?

4. Use the data from the table to make a line graph showing population numbers as a function of time for each of the different generation lengths. Use the x-axis to represent time (in years) and the y-axis represent population numbers. What conclusions can you draw?

5. Teenagers who start their families before the age of 20 are likely to have more children than the average American. How would this effect the larger population? Draw a family tree for family A with three children per mother instead of two. Add this data to your graph from #4. What trends do you see?
A Matter of Timing
Family _____

Use a separate template for each family tree. The first mother is already placed on the "Year 0" line. Place her children on or between the appropriate lines.

Year 0
Generation 1

Year 10

Year 20

Year 30

Year 40

Year 50

Year 60

Year 70

Year 80