

300,000,000! IN THE USA

Concept:

Population growth occurs when a species' birth rate exceeds its death rate. Populations cannot grow indefinitely in a finite space.

Objectives:

Students will be able to:

- Describe how birth and death rates affect population growth.
- Explain how birth and death rates have changed over US history.

Subjects:

Social Studies, Science, Math, Geography, Health, History

Skills:

Observing, critical thinking, calculating with fractions

Method:

In a short demonstration, students observe how populations grow when the birth rate exceeds the death rate.

The Stork and the Grim Reaper USA

Introduction:

In the United States, approximately 15 people are born for every 9 who reach the end of their lives. Every environment has a carrying capacity: a limit to the number of members of a certain species it can support. Our population growth has the potential to exceed the carrying capacity of our country. This activity is a visual demonstration of the relationships between birth rate and death rate and of population growth within a finite space.

Usually we think of carrying capacity in terms of animals and plants (how many frogs can live in a pond), but it applies to humans, too. People consider more than just the basics of food, water and shelter when we measure an area's carrying capacity. We include the idea of *quality* of life. Because we expect so much more from our surroundings than animals do, we have to be more thoughtful about how many of us can live in one place.

Materials:

Large bowl/bucket of water
Clear container (1 quart capacity)
Standard kitchen set of measuring cups
Food coloring
"Stork" and "Grim Reaper" signs
Paper towels (for clean up)

Procedure:

1. Fill the bucket with water and add a couple drops of food coloring. Place the clear container with the towel under it in front of the class.
2. Ask for two volunteers from the class to assist. Designate one the "Stork" and the other the "Grim Reaper." Each student should affix the appropriate label to him or herself. Make sure that the class understands that the stork symbolizes births, and the grim reaper symbolizes deaths.
3. Hold up the clear container.

"This will represent the United States, and the colored water in the bucket will represent people. Stork, you'll be adding people to the USA by pouring dippers of water into the container. Grim Reaper, you'll be taking people by scooping water out of the clear container and pouring it back into the bucket. At this time, the birth rate in the United States is 14.7 per thousand and the death rate is 8.7 per thousand. That means in an average group of 1,000 Americans, we'd expect about 15 children to be born and about 9 people to reach the end of their lives over the course of a year."



Population



Quality of Life

- Ask the class which dippers the stork and the grim reaper should receive. (The ratio will be closely approximated if the stork gets the 1/2 cup and the grim reaper gets the 1/3 cup. It is also acceptable, but not quite as close, if the stork gets 1 cup and the grim reaper gets 1/2 cup.)

“Based on that fact, who should receive the large dipper?” (Stork) “Who should use the small dipper?” (Grim Reaper)

- Signal the Stork and Grim Reaper to start. Make sure that for every dipper-full the Stork adds, the Grim Reaper subtracts one. They should continue in turn while the class observes. When it becomes clear that the water level is steadily rising, ask the Stork and Reaper to stop.

Discussion Questions

- Why did the water level rise steadily? What does this tell us about population growth in the United States?

Because more was being added than taken out. When the birth rate is greater than the death rate, a population grows.

- What would happen if the stork and the grim reaper kept dipping?

The water would overflow.

- What would this mean if the clear container really was the United States?

It would mean that the carrying capacity has been exceeded and that not all of these people could survive.

- Do the stork and the grim reaper help us see migration into and out of the United States?

No, the difference between the birth rate and the death rate is what population scientists call “natural increase.” Any changes resulting from immigration or emigration would be on top of these rates.

- What size would the Grim Reaper’s dipper have to be for the water level to stay the same?

The same size as the Stork’s dipper.

- Throughout US history, our birth rates and death rates have changed dramatically. Consider the following chart:

Year	Birth rate	Death rate
2000	14.7	8.7
1950	24.1	9.6
1900	37.6	17.2
1850	51	20
1800	55	27

- Which has fallen farther, the birth rate or the death rate?

The birth rate has fallen farther, from 55 per thousand to about 15 per thousand, a difference of 40 per thousand. The death rate has dropped 18 per thousand.

- When was the birth rate to death rate ratio the lowest?

In 2000. Our birth rate and death rate are closer now than at any other time in U.S. history.

- When was the ratio the greatest?

In 1850 and 1950, when the birth rate was 2.5 times the death rate.

7. What might have caused the decline in the stork's dipper?

Family sizes have gotten smaller. In 1800, the typical family had 7 or 8 kids. Now, the average is around 2 children per couple.

8. What might have caused the decline in the grim reaper's dipper?

Advances in medicine: Doctors gradually became better at healing people because of new discoveries in the sciences.

Better sanitation: People invented safer ways of disposing of garbage and human waste so their surroundings were cleaner and didn't breed so much disease.

Better nutrition: Advances in farming made it possible to grow better food in greater quantities. Also, improvements in medicine made people more aware of the importance of eating a variety of foods.

All of these things worked to allow more people to survive infancy and childhood and extended the average lifespan. From 1800 to today, the life expectancy in the United States has increased from 35 years to 78 years.

9. What is the carrying capacity of our classroom? Think about the following questions:

How large is the room?

How much space does each person take?

How much space is taken by resources: tables, chairs, desks, etc.?

How much open space is needed to have the class run smoothly?

Could you comfortably fit twice as many people in the classroom as you have now?

10. What is the carrying capacity of your home? (Think of the number of people who could regularly eat and sleep there.)

11. What do you think is the carrying capacity of the United States? How could we tell if we were nearing the carrying capacity?

Follow-up:

To compare the current population growth rate to 1800's growth rate in the USA, set up a "race" between the two years. For this simulation, you will need a second supply of water and a bowl of the same size. Use the same measuring cups for 2000. For the year 1800, use a 1/2 cup measuring cup to represent the birth rate (55 per 1,000) and the 1/4 cup for the death rate (27 per 1,000). Instruct students with the cups to scoop water only at your prompt. Instruct students to scoop water once, and repeat until one of the pairs of students has moved all their water to the 'population' bowl.

How many 'years' (or scoops) does it take for one of the populations (1800 or 2000) to use up all its water (to increase their population until the supply of water has run out)? Which of the two years reached this point first? (1800) Why did the population increase more rapidly in 1800 than today? (*The difference between the birth and death rates was larger*)

Explain to students that, even though the 1/2 cup measure is used for both simulations, the actual birth rate was much higher in 1800. The same size cup is used because the death rate was also higher in 1800, and so the proportions are not as different as the actual numbers.

Source data:

Birth rate data 1800-2000, death rate data 1900-2000: US Census Bureau.

Death rate data 1800-1850: Herbert S. Klein. A Population History of the United States. New York: Cambridge University Press, 2004.