

Maps of demographic data and standard-of-living indicators reveal differences between Europe and Africa.

Module 4: Lesson 2



Growing pains

A regional investigation of Europe and Africa

Lesson overview

In this lesson, students will compare the processes and implications of population growth in one of the world's fastest growing regions, sub-Saharan Africa, and the slowest growing region, Europe. Through the analysis of standard-of-living indicators in these two regions, students will explore some of the social and economic implications of rapid population growth.

Estimated time

Two to three 45-minute class periods

Materials

The student worksheet files can be found on the Data and Resources CD. Install the teacher resources folder on your computer to access them.

Location: OurWorld_teacher\Module4\Lesson2

- Student PDF: M4L2_student.pdf
- Student answer sheet: M4L2_student_answer_sheet.doc
- Student assessments: M4L2_assessment.pdf

Additional materials










- One sheet of drawing paper and one marker per student

Objectives

After completing this lesson, a student is able to do the following:

- Describe the fundamentals of population growth by explaining the relationship between birth rate, death rate, and natural increase
- Identify the fastest and slowest growing regions in the world today
- Explain the socioeconomic implications of rapid population growth
- Explain the slow population growth in Europe and how standard-of-living indicators are affected
- Explain the rapid population growth in areas of Africa and how standard-of-living indicators are affected

GIS tools and functions

-  View attributes for a feature on a map
-  Zoom in or out on the map
-  Add a layer to the map
-  Zoom to the full map extent
-  Go back to the previous map extent
-  View the entire layout page
-  Change the layout template
-  List layout templates
-  Select, move, and resize layout elements
 - Turn layers on and off
 - Expand and activate a data frame
 - Create and print two layouts using different data frames

National Geography Standards

Standard	Middle school	High school
1 How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective	The student knows and understands how to use maps to analyze spatial distributions and patterns	The student knows and understands how to use geographic representations and tools to analyze and explain geographic problems
9 The characteristics, distribution, and migration of human populations on Earth's surface	The student knows and understands the demographic structure of a population	The student knows and understands trends in world population numbers and patterns
18 How to apply geography to interpret the present and plan for the future	The student knows and understands how to apply the geographic point of view to social problems by making geographically informed decisions	The student knows and understands how to use geographic knowledge, skills, and perspectives to analyze problems and make decisions

Teaching the lesson

Introducing the lesson

Begin the lesson with a discussion of world population growth. Remind students that the world's population reached six billion in 1999 and continues to grow.

Consider the following questions:

- Why is the earth's population growing?
- Are all regions growing at the same rate of speed?
- What does "overpopulation" mean, and at what point would you characterize the world as overpopulated?

If your community or state is growing, that would be a good starting point for this discussion. How has population growth affected your community or state? Do students see this as a good thing or a bad thing?

Student activity

We recommend that you complete the activity yourself before presenting the lesson in class. Doing so will allow you to modify the activity to accommodate the specific needs of your students. If they will not be working on individual computers, be sure to explain any necessary modifications.

Distribute the activity to students. Explain that in this activity they will use GIS to compare a region of the world where population is growing fast and a region where it is growing slowly. They will also investigate the relationship between a region's rate of population growth and its standard of living.

The following are things to look for while the students are working on this activity:

- Are the students using a variety of tools?
- Are the students answering the questions?
- Do students need help with the lesson's vocabulary?

Concluding the lesson

When the class has finished the activity, give each student a piece of drawing paper on which to write his or her hypothesis from Q17. Students should tape their hypotheses to the wall or blackboard and discuss them. Look for similarities and differences among the hypotheses. Allow students to question each other to clarify confusing or contradictory statements. If possible, try to reach consensus about the relationship between a country's rate of natural increase and its standard of living based on evidence from the activity.

Middle school assessment. Students will play the role of a special liaison to the United Nations, in charge of establishing a partnership between a slow growing nation and a fast growing nation. They will need to identify issues critical to each country and devise a way the countries can form a partnership to improve their standards of living.

High school assessment. Students will play the role of a special liaison to the United Nations, in charge of establishing a partnership between a group of slow growing nations and a group of fast growing nations. They will need to identify issues critical to each group and devise a way the countries can form a partnership to improve their standards of living.

Extending the lesson

Challenge students to try the following:

- Explore and map additional attributes from the module 4 data folder. Look for additional social and economic implications of rapid population growth.
- Test your hypothesis about the relationship between standard of living, net migration, and the rate of natural increase by investigating countries in other parts of the world.
- Explore an African country's population, birth rate, death rate, and standard-of-living indicators and write a report about the country, including a map layout.
- Use ArcMap attribute queries to identify countries that do not match your hypothesis. Try to figure out an explanation for these anomalies.
- Explore gender differences in standard of living in Europe and/or sub-Saharan Africa. Using the module data, map and analyze male and female life expectancies, male and female literacy rates, and male and female infant and child mortalities.
- Conduct research on the impact of HIV/AIDS on death rates and population growth in sub-Saharan Africa.

See the “Resources by Module” section of this book’s Web site—www.esri.com/ourworldgiseducation—for print, media, and Internet resources on the topics of Africa, Europe, demographics, and standard-of-living indicators.

Answer key

Step 2: Compare birth rate and death rate data

- Q1. Which world region or regions have the highest birth rates? **Africa, South Asia**
- Q2. Which world region or regions have the lowest birth rates? **North America, Europe, Russia, Australia**
- Q3. Which world region or regions have the highest death rates? **Africa**
- Q4. Which world region or regions have the lowest death rates? **Mexico, Central America, western South America, Northern Africa, Southwest Asia**
- Q5. If the overall rate of growth is based on the formula $BR - DR = NI$, which world regions do you think are growing the fastest? **Areas of sub-Saharan Africa, Arabia, and Central America**
- Q6. Which world regions do you think are growing the slowest? **Many European countries, Russia**
- Q7. Choose two European countries and two African countries and record their birth and death rates in the table below. **Answers will vary and may include the following:**

Country and continent	Birth rate/1,000	Death rate/1,000
Niger (Africa)	50.16	20.59
Spain (Europe)	9.98	9.81
Hungary (Europe)	9.66	13.05
Ethiopia (Africa)	37.39	14.67
Chad (Africa)	45.30	16.04

- Q8. List three questions that the Birth Rate and Death Rate maps raise in your mind. **Answers will vary.**

Step 3: Add the Natural Increase layer

- Q9. What is happening to the populations of countries that are pink? **Their death rates exceed their birth rates. Over time these populations will decline unless migration into the countries makes up for the negative natural increase.**
- Q10. Which world regions are growing the fastest? **Sub-Saharan Africa and Southwest Asia**
- Q11. Which world regions are losing people or not growing? **Eastern Europe, Russia, and southern Africa**
- Q12. Think about what it would mean for a country to have a population that is growing rapidly or one that is growing slowly or shrinking. Which of these two situations do you think would cause more problems within the country? **Students may answer that either situation or both situations can lead to problems.**

List some of the problems you would expect to see. **Answers will vary, but students who answered that rapid growth would cause more problems should recognize that a country with rapid growth will have a difficult time keeping up with the constantly increasing need for education, health care, social infrastructure, resources, and jobs. Students who answered that a shrinking population would cause more problems should list effects such as inability to defend itself, loss of industry, inability to fill industrial or technology jobs, the pressure to increase immigration, and so on.**

Step 4: Look at standard-of-living indicators for Europe and Africa

Q13. Complete the table below.

Indicator	Compare sub-Saharan Africa and Europe	What does this indicate about the standards of living in these regions?
Population 65 years or older	Sub-Saharan Africa: Most countries have 1.64% to 4.42% in this age group. Europe: Most countries have 15.42% to 22.66% in this age group.	Africa: Low percent indicates many people die prematurely and do not reach old age. Low standard of living. Europe: High percent indicates more people live into their sixties and beyond because of good health care, sanitation, adequate food supply, and so forth. High standard of living.
GDP per capita	Sub-Saharan Africa: Most countries have the lowest level of GDP. Europe: Most countries have the second-highest or highest level of GDP.	This is not the same as average income—be sure that students do not make that assumption. A higher GDP per capita does indicate a wealthier country, and that means more money to spend on the infrastructure. High GDP means a high standard of living and enough capital to continue to grow and expand economically.
Infant mortality rate	Sub-Saharan Africa: All countries have 21.89 or more infant deaths/1,000 born. Europe: Almost all countries have fewer than 21.89 infant deaths/1,000 born.	High rate of infant mortality indicates a low standard of living. This statistic is typically used to evaluate the health conditions (sanitation, health care, food supply, disease, etc.) in a country because newborns are much more susceptible to death from health hazards than adults or older children.
Life expectancy	Sub-Saharan Africa: Most countries have a life expectancy of less than 57.87 years. Europe: Most countries have the highest life expectancy, 75.35–83.52 years.	A higher life expectancy indicates a higher standard of living because it reflects the presence of conditions that sustain life and/or a relatively low presence of threats to life.
Literacy rate	Sub-Saharan Africa: Only a few countries have literacy rates above 84%. Europe: Almost all countries have literacy rates of at least 94.11%.	Information on literacy, while not a perfect measure of education in a country, is probably the most easily available and valid for international comparisons. Low levels of literacy and education in general can impede the economic development of a country in the current rapidly changing, technology-driven world.
Percent of workforce in service sector	Sub-Saharan Africa: The service sector of the workforce is below 61% in most countries. Europe: The service sector of the workforce is above 61% in most countries.	A higher percent of the workforce in the service sector indicates a higher standard of living. As a country becomes more developed economically, a larger percent of its workforce is employed in the service sector. The workforce in less developed countries is characterized by higher percent of workers in agriculture and industry.

Step 5: Add the Net Migration layer

Q14. In Q13 you compared standard-of-living indicators in Europe and sub-Saharan Africa. Based on your observations of those indicators, which region would you expect to have a negative net migration? A positive net migration?

Negative: **Sub-Saharan Africa (countries with low standards of living)**

Positive: **Europe (countries with high standards of living)**

Explain your answers: **Answers will vary, but students should recognize that there will be more out-migration from countries with low standards of living and more in-migration to countries with a higher standard of living.**

Q15. Summarize the overall patterns of net migration in Europe and sub-Saharan Africa in the table below.

Net migration in sub-Saharan Africa	Net migration in Europe
There is no clear pattern. Some countries have net in-migration, and others have net out-migration.	Western Europe has net in-migration, and most Eastern European countries have net out-migration.

Q16. What political or social conditions or events could explain any of the migration patterns you see on the map? **Possible answers include Balkan wars, fall of communism, higher standard of living in Western Europe, and the end of civil war in Liberia.**

Step 6: Draw conclusions

Q17. Based on your map investigations, write a hypothesis about how a country's rate of natural increase affects its standard of living and its net rate of migration. **Answers will vary, but students should note that natural increase has a direct effect on standard of living and that standard of living creates push-pull factors that influence migration.**

Q18. In the table below, illustrate your hypothesis with data from one European country and one sub-Saharan African country. **Answers will vary depending on the hypothesis that was formulated in Q17. However, students should include natural increase, net migration, and other data that support their hypotheses.**

Europe	Data	Africa
	Country name	
	Natural increase	
	Net migration	

Step 7: Design a layout

Q19. What are the units of measurement? **Kilometers**

Assessment rubrics

Middle school

Standard	Exemplary	Mastery	Introductory	Does not meet requirements
1 The student knows and understands how to use maps to analyze spatial distributions and patterns	Uses GIS to compare and analyze growth and demographic trends in two countries; makes predictions from the data on future population trends; creates original maps to support findings	Uses GIS to compare and analyze growth and demographic trends in two countries; creates views that isolate regions of slow and fast growth; creates maps to support findings	Uses GIS to identify regions and countries with slow and fast growth rates; printed maps do not support findings	Has difficulty identifying demographic patterns; does not print any maps
9 The student knows and understands the demographic structure of a population	Analyzes demographic data of two countries with fast and slow growth rates and draws conclusions on how the population structure of each country came to exist	Identifies and analyzes data that illustrates the demographic makeup of two countries with slow and fast growth rates	Identifies demographic characteristics of countries with slow and fast growth rates	Has difficulty identifying differences between countries with slow and fast growth rates
18 The student knows and understands how to apply the geographic point of view to social problems by making geographically informed decisions	Identifies critical growth issues for a country of fast growth and a country of slow growth; creates a detailed program through which the countries could establish a partnership to solve growth-related issues; elaborates on how this program could be replicated by other countries	Identifies critical growth issues for a country of fast growth and a country of slow growth; determines several ways that the countries could form a partnership for the mutual benefit of both in regard to growth issues	Identifies critical growth issues for a country of fast growth and another of slow growth; determines one or two ways the countries could form a partnership	Identifies critical growth issues for two countries but does not address the issue of establishing a partnership between them

This is a four-point rubric based on the National Standards for Geographic Education. The mastery level meets the target objective for grades 5–8.

High school

Standard	Exemplary	Mastery	Introductory	Does not meet requirements
1 The student knows and understands how to use geographic representations and tools to analyze and explain geographic problems	Uses GIS to compare and analyze growth and demographic trends in countries throughout the world; makes predictions from the data provided and additional sources on future population trends; creates original maps to support findings	Uses GIS to compare and analyze growth and demographic trends in countries throughout the world; makes predictions from the data on future population trends; creates maps to support findings	Uses GIS to compare and analyze growth and demographic trends in countries throughout the world; makes predictions from the data on future population trends; printed maps do not support findings	Attempts to make comparisons between countries using demographic data in a GIS; does not print any maps
9 The student knows and understands trends in world population numbers and patterns	Creates two groups of countries, each with similar demographic trends, including standard-of-living indicators; one group represents fast-growth countries, and the other represents slow-growth countries; makes predictions on how these trends will change through time	Creates two groups of countries, each with similar demographic trends, including standard-of-living indicators one group represents fast-growth the other represents slow-growth countries	Creates two groups of countries with similar growth characteristics; one group represents fast-growth countries, and the other represents slow-growth countries	Identifies one or two countries that represent either slow or fast growth
18 The student knows and understands how to use geographic knowledge, skills, and perspectives to analyze problems and make decisions	Creates a report that establishes a coalition of slow- and fast-growth countries that work together for the mutual benefit of all involved; the report takes into account issues critical to the countries that participate and elaborates on possible solutions	Creates a report that establishes a coalition of slow- and fast-growth countries that work together for the mutual benefit of all involved; the report takes into account issues critical to the countries that participate	Lists several issues that are critical to fast- and slow-growth countries; attempts to find ways in which the countries can partner	Identifies one or two issues critical to countries with slow growth and those with fast growth

This is a four-point rubric based on the National Standards for Geographic Education. The mastery level meets the target objective for grades 9–12.