

POPULATION DYNAMICS
Connecting Past, Present and Future
A Four-Part Curriculum

PART D
America's Baby Boom and Global Youth Bulges

by
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Connecting Past, Present and Future
A Four-Part Curriculum

<http://clexchange.org/curriculum/complexsystems/populationdynamics/>

PART A

Push and Pull Forces in Settling America

PART B

Push and Pull Forces in U.S. Colonial History

PART C

U.S. Urbanization from 1820-1920

PART D

America's Baby Boom and Global Youth Bulges

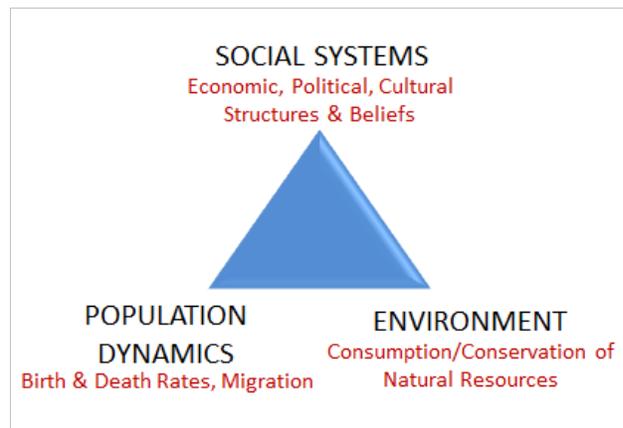
TEACHER INSTRUCTIONS

POPULATION DYNAMICS – Part D America’s Baby Boom and Global Youth Bulges

OVERVIEW

Often lost in students’ study of history is its relevance to the present and possible future. “Baby booms,” involving temporary surges in birth rates (e.g., U.S. between 1946 and 1964), and “youth bulges,” involving both high birth rates and dramatic declines in infant and child mortality rates that allow more children to reach adulthood and have their own children, offer powerful proof that the past continues to shape the present and future.

Using guided handouts, students can do these supplementary lessons, either during or outside of class time, or within a flipped classroom context. They provide a framework to help students conceptualize how population dynamics *cause* changes in social systems and environments while being also *affected* by them (graphic on right). Additionally, simulations encourage students to explore future implications of historical baby booms and youth bulges and to experiment with alternative and



more sustainable long-term scenarios. Using multiple resources and structured problem-solving, these lessons encourage students to connect historical trends, structures, and relationships with real-world present and future challenges.

INTRODUCTIONS TO SIMULATIONS/STUDENT ACTIVITIES

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynD.asp>

Simulation 1: Youth Bulges - What Are the Global Implications of Changing Birth and Death Rates?

In the first simulation, students actively examine the roughly 60 countries across the globe that the UN has characterized as Least Developed Countries (LDCs). Students will consider what impact youth bulges have had in shaping those countries’ recent past and what concerns have been raised about their futures.

Students will:

1. Examine recent historical dynamics within the LDCs involving changing population dynamics, social systems, and their environments, and identify relationships between these three broad sectors that contribute to recurring historical patterns of significant change.
2. Use a demographic simulation to better understand the dynamics underlying the historical and continuing youth bulge in LDCs (where a majority of a country's population includes youth and young adults) and the future implications to 2060 (should current fertility and death rates continue) on overall population size and its make-up (including more older working and retired-age adults).
3. Use the simulation to consider possible alternative population futures, based on changing fertility and mortality rates, and their implications on social systems (jobs and economic development) and the environment.

Simulation 2: How Will America's Baby Boom (1946-1964) Impact Its Future?

In the second simulation, students explore the effects of America's baby boom on its future, specifically focusing on the potential impact on the survival of the Social Security Fund.

Students will:

1. Consider how America's social systems and its environment combined with population dynamics to shape the 19-year long baby boom and, in turn, how the baby boomers over time have (re)shaped the American environment and its social systems.
2. Learn how the Social Security Fund functions both with regard to income (based on taxes and interest) and expenditures (paying out benefits to qualified retirees).
3. Use the simulation to explore possible futures for the Social Security Fund, based on changing population dynamics involving retiring baby boomers and the overall size of the American workforce.
4. Explore the impact of different policy options for sustaining the long-term solvency of the Social Security Fund.

NOTE: Each of the two simulations includes a student handout with clear instructions for using the simulation. In addition, specific prompts for written responses challenge students to document and explain their learning.

STANDARDS AND METHODS

As with earlier lessons, both simulations engage students by approaching history as active problem-solving, to encourage them to synthesize learning from a variety of traditional and non-traditional sources, and to apply their learning by connecting historical patterns, systemic structures, and relationships to challenges in the modern world. These processes address three important sets of standards:

1. Content:

The College Board identifies twelve major themes that *encourage students to think conceptually about the American past and to focus on historical change over time.*¹

- A. Sim 1 (youth bulges) highlights the following themes: globalization, demographic changes, economic changes, religion, and war.
- B. Sim 2 (America’s baby boom) highlights the following themes: demographic changes, economic transformations, environment, culture and the American identity.

2. Method:

The Common Core Standards stipulate that students learn to integrate information from both primary and secondary sources to forge *a coherent understanding of an idea or event, noting discrepancies between sources.*² This lesson uses primary and secondary historical sources, incorporated with demographic simulations. Students actively reconstruct a past where population change is both the *result of* and the *agent for* change in other areas including the economy and environment.

- A. Sim 1 includes graphs, UN reports, and other sources for students to reconstruct relationships between population dynamics, environment, and social systems.
- B. Sim 2 includes graphs, pictures, primary and secondary sources for students to reconstruct multifaceted elements of change that contribute to America’s 16-year baby boom and the challenges confronting the Social Security Fund.

3. Relevance:

The National Council For Social Studies specifies the need *to empower students to make connections between learning and their world, to support active citizenship.*³ This is the central focus of both simulations: to challenge students to grapple with the future prospects of a world grounded in the past, and to exercise an understanding, of patterns and structures and thus become competent “systems citizens” in pursuing actions that effect positive change.

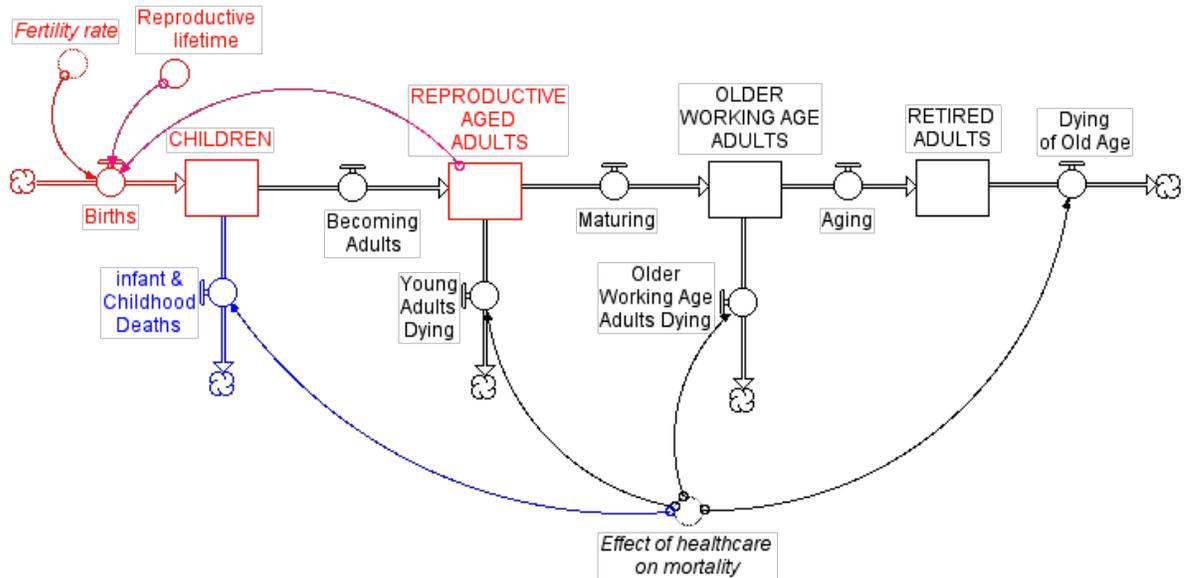
¹ See <http://apcentral.collegeboard.com/apc/public/repository/ap-us-history-course-description.pdf>

² See <http://www.corestandards.org/ELA-Literacy/RH/11-12/>

³ See <http://www.socialstudies.org/standards/execsummary>.

FOR THOSE INTERESTED: HOW DO THE SIMULATION MODELS WORK?

Each of the two simulations uses a variant of the system dynamics model shown below. *Note that this is developed in more detail on the Introduction page of the simulation (Getting Started).*



Briefly:

- Where fertility rates are high (true for both baby booms and youth bulges), populations of children will also be high (shown in red).
- Where healthcare improvements have significantly reduced infant and child mortality rates (shown in blue) and fertility rates remain high, large numbers of children will become adults and repeat the cycle (youth bulges).
- Where improved healthcare has extended adult lifespans (shown in black), adult populations including elders will add to overall population growth.

Today's world is being shaped not only by baby booms and youth bulges. In developed nations across the world where fertility rates are low and continue to fall, including the United States, Europe, and Japan, smaller numbers of children are being born. At the same time, extended lifespans lead to ever growing populations of aging adults. The challenge for these countries involves sustaining workforces while caring for larger numbers of elders.

In summary, today's challenges, while very different in developed versus developing countries, underscore the power of past patterns, structures, and systems in shaping the present and the future. By providing students with tools to make these connections and to explore future policy options, these simulations offer a foundation for undertaking meaningful discussion.

Teacher Guide – Part D, #1

What Are the Global Implications of Youth Bulges?

This handout will guide you through a series of problem-solving exercises that:

- *focus on historical patterns of population change (or dynamics) and systemic relationships and structures that have shaped these patterns; and*
- *simulate different possible implications of past and present youth bulges on the future.*

What happens if current trends continue? Can or should efforts be undertaken to pursue alternatives?

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynD.asp>

STEP 1. Familiarize Yourself with the Introduction

Open and read each of the links.

What is a baby boom in comparison to a youth bulge?

A baby boom involves a temporary increase of babies being born (as in the case of the U.S. between 1946 and 1964). A youth bulge involves a high ongoing birth rate (women having many children) accompanied by economic (healthcare) development that reduces deaths. The result of both phenomena is that, at least for a time, children and young people are disproportionately represented.

Identify two countries in each category:

Pull (more immigration): any country shown on the map in brown – including much of Africa, Latin America, and Asia

Push (more emigration): countries shown in blue – including the U.S., Canada, Western Europe, and Australia

Name the four groups of people in a population and how they impact other groups. This information is contained in the “Getting Started” link.

Group 1: Children

Group 2: Reproductive-Aged Adults

Group 3: Older Working-Age Adults

Group 4: Retired Adults

One factor is the size of the reproductive-aged population, typically half of whom are women capable of having babies. A second factor is the average number of children a woman conceives during her reproductive years (or lifetime). This is referred to as a "fertility rate." Over time, many children grow into adulthood but others will die. Historically, in less developed countries, infant and youth mortality is high. That means that fewer children will reach adulthood and have children of their own. In places where

infant mortality is low and fertility rates are high, many children are born, mature, and later give birth to large numbers of children themselves.

Another dynamic process involves people living beyond their reproductive years (typically in their early 40s). Once again, death rates have a significant impact on the population. In places where adults live shorter lives on average, older populations are generally smaller. Remember, until the recent past, average life expectancy was in the 50s or 60s. In places where life expectancy is high, older populations tend to be larger. In America in 2014, the average life expectancy was over 78 years.

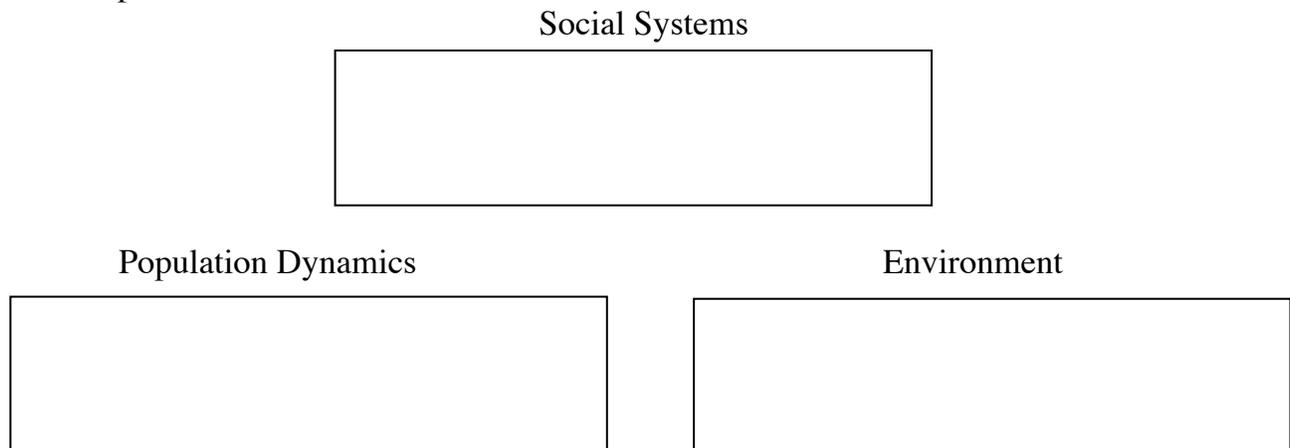
In countries where fertility rates are high (4-6 children per woman) AND the population of reproductive-aged women is large, there will be a high number of births.

A major force of change in the recent past is the rise of modern healthcare. Dramatic improvements have led to significant reductions in infant and youth mortality. Health care improvements have reduced adult death rates and increased life expectancy, creating larger populations of older people.

How does healthcare impact a population?

Healthcare reduces death rates. Historically, healthcare has reduced infant and childhood mortality, leading to more children reaching adulthood, and it has extended life expectancy, which has led to more older adults.

Read each of the triangle “points” and then show with arrows and describe with words one impact of one on another.

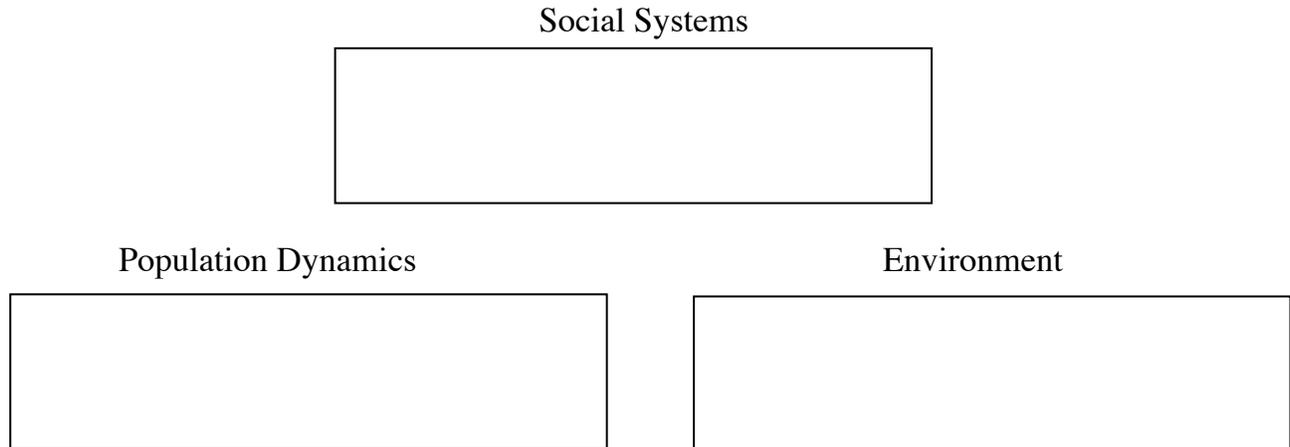


There are many possible responses. Some illustrations might include:

- Growing populations place greater demands on their environments (e.g., land, water, other natural resources) which can lead to political stress/instability; or
- Growing populations offer opportunities for economic growth, which can help build prosperity...and so on.

STEP 2. What is the Population Dynamic of LDCs, and How Did it Develop Historically?

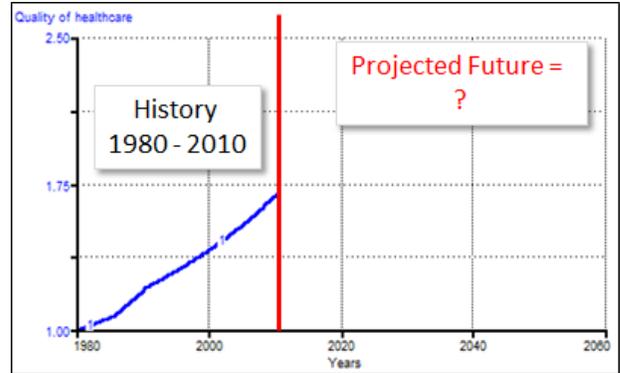
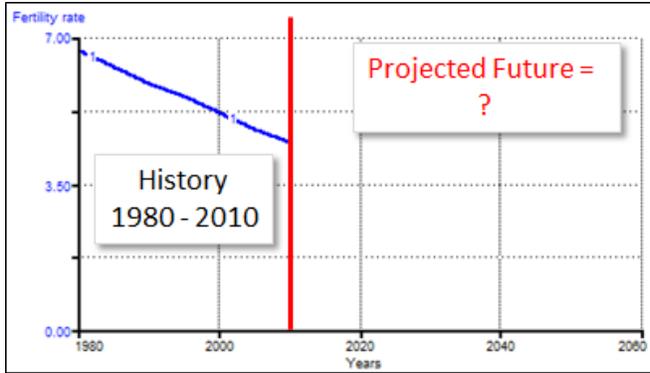
Open Sim 1 and read Page 1. Using the triangle visual, describe how population dynamics, environment, and social systems have contributed to the youth bulge enveloping more than 60 countries in the world today.



In the population sector, healthcare improvements have led to reduced infant and adult mortality, while birth rates have fallen more slowly. That has led to rapid population growth and a youth bulge. As a consequence, many LDCs have had problems keeping up with feeding, housing and employing their populations. Growing populations have migrated to cities, which, lacking jobs and infrastructure to support them, has led to political stress in many of these countries.

STEP 3. How Might the Present Affect the Future?

1. Open Page 2 and read the Instructions. The underlying computer model has been calibrated to accurately simulate the historical growth in total population of LDCs from 1980 – 2010 using the following information:
 - Population – There's an initial population in 1980 of 400 million, divided as follows:
 - 220 million Children under the age of 14
 - 100 million Adults aged 16 to 44
 - 60 million Older People aged 45-64
 - 20 million Elderly over the age of 65
 - Fertility– In 1980, each woman in LDCs had an average of 6.7 children; by 2010, that number had fallen to 4.2.
 - Mortality – Healthcare improvements in LDCs helped drive the average death rate from 19 per 1000 in 1980 to 9 per 1000 in 2010. This is shown as healthcare improving from a starting value of 1.00 in 1980 to 1.70 by 2010.



Click on the underlined scenarios, as explained in the Instructions, to see how these graphs will be completed as a result of your choices. The default choices are “Slowly Declining” fertility and “Rapidly Improving” mortality.

2. What might the future hold? The simulation allows you to experiment with a number of different scenarios. Start by considering what happens if current trends in fertility (birth rates) and mortality (death rates) continue (Scenario 1). Then use the buttons to consider three alternative scenarios listed in the table below. Record the projections for 2060.

	Populations (in millions)				
	TOTAL	Children	Adults	Older	Elderly
1980	400	220	100	60	20
1. <u>CURRENT TRENDS</u> CONTINUE “Slowly Declining” fertility “Rapidly Improving” healthcare	1505	366	586	299	253
2. <u>ADAPTIVE</u> “Rapidly Declining” fertility “Moderately Improving” healthcare	935	143	359	224	209
3. <u>REVERSAL</u> “Baby Boom” fertility “Slowly Improving” healthcare	1614	366	670	336	242
4. <u>YOUR SCENARIO</u> _____ fertility _____ healthcare					

3. Compare scenarios (Page 1, graph on left). Of fertility and mortality, which has the potential to exert a greater impact in stabilizing populations over time in LDCs? Explain why below.

Based on the first three scenarios, it should be clear that efforts to reduce fertility from their current levels will have the greatest impact on stabilizing populations. Death rates are already low, so further reductions will not have as great an impact.

STEP 4. Reflect on What You Have Learned

The questions that follow are intended for students to think more deeply about what they've learned and how they can apply it.

1. Is there a particular alternative to continuing historical/current trends in fertility and mortality that will reduce the rate of population growth in LDCs in the future? Explain.

Many LDCs are in the midst of the “demographic transition,” the process through which economic development and healthcare advances improve infant/child survival rates. As a result, women elect to have smaller families, thereby slowing the overall growth in populations. This is represented by the default settings of the simulation – slowly declining fertility and rapidly improving mortality. The simulation shows the choice of rapidly declining fertility together with any mortality choice to be a “better” outcome in terms of lower population growth. Reducing fertility rates is a powerful leverage point in helping LDCs to control population growth.

2. Beyond reduced numbers, what are the advantages to that outcome? What might be the disadvantages?

Reduced population growth offers LDCs opportunities to balance the needs of their populations with their environments and social systems. Continued efforts to improve healthcare, without greater reduction in fertility and family size, may lead to even faster population growth and further economic, political, and/or social problems in these countries.

3. Assuming the advantages outweigh the disadvantages, what are the challenges in implementing the change you're recommending? How can these challenges be overcome?

The primary challenge involves educating LDC residents about the benefits of smaller families and less rapid overall population growth. Traditional high fertility rates assumed that many children would die in infancy or childhood, and that those who grew to adulthood could support their parents. Critical to the success of smaller families involves addressing parents' cultural concerns or misgivings. Education, together with policies that provide social safety nets, should be powerful tools for overcoming cultural resistance.

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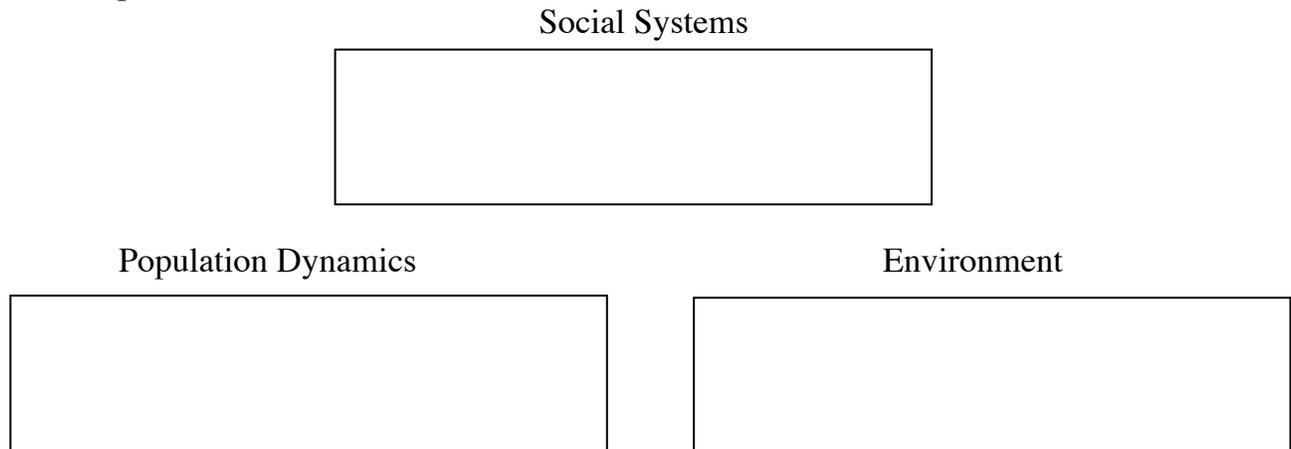
Group 2:

Group 3:

Group 4:

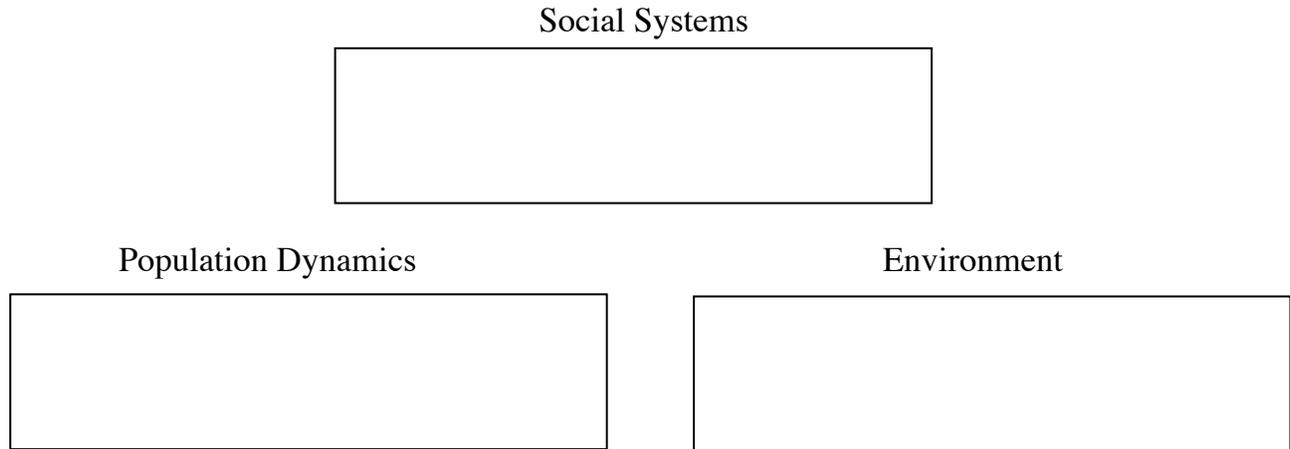
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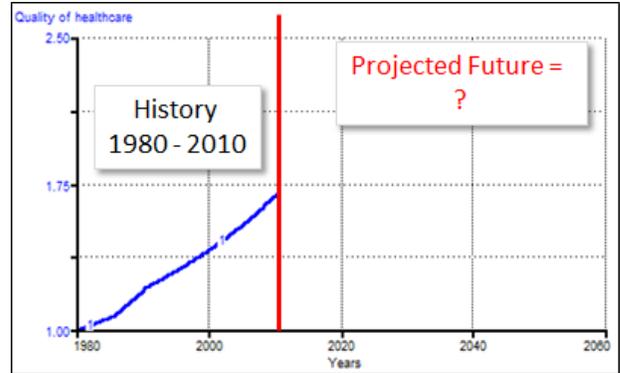
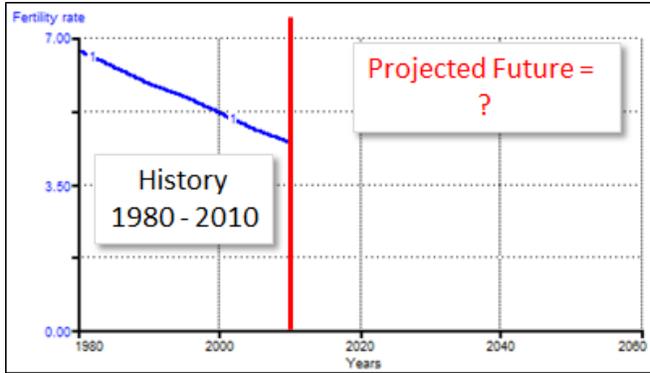
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Teacher Guide – Part D, #2
Will the Social Security Fund Survive America's "Baby Boom" Generation?

This handout will guide you through a series of problem-solving exercises that:

- *focus on systemic relationships and structures that contributed to America's baby boom;*
- *illustrate where and how this subpopulation has impacted America's environment and social systems in the past and present; and*
- *simulate possible future impacts of baby boomers on one illustrative social system, the Social Security Fund.*

What happens to the fund if current practices continue? Can and should efforts be undertaken to pursue alternatives?

<http://clexchange.org/curriculum/complexsystems/populationdynamics/popdynD.asp>

STEP 1. What Prompted and Sustained America's Baby Boom From 1946 to 1964?

Open Sim 2 and read Page 1. Using the links around the triangle, tell why you think America's baby boom lasted from 1946 to 1964.

The initial boom reflected the return of millions of servicemen home from World War II (with economic support from the GI Bill) and the end of financial difficulties associated with the Great Depression. Continuing economic prosperity and growth – in part fueled by the baby boom (which helped foster home construction/suburbanization, auto sales, etc.) – helped sustain the boom to 1964.

STEP 2. How Have America's Baby Boomers Impacted American Society Over Time?

Read Page 2 and then explain the concerns regarding the future solvency (ability to pay) of the Social Security Fund.

The number of Social Security recipients will grow substantially in the future, in large part fueled by the retirement of baby boomers (and also by people living longer due to continuing healthcare improvements). At the same time, the falling birth rate after 1964 translates into a smaller working population. While the Social Security Fund has traditionally taken in more money in taxes than it has paid out, this pattern is changing. The result, based on current overall taxes/overall income and average benefits/total expenses, is that the fund will run out of money.

STEP 3. Will the Social Security Fund Survive America's Baby Boom Generation?

While computer models cannot predict the future with certainty, this simulation tracks the aging of baby boomers within the overall context of America's changing population dynamics.

1. Open Page 3 and read the instructions for Sim 2. Note that the simulation begins in 2010 (as the first baby boomers were retiring) and runs through 2060, using the following data:

- The US population in 2010 was 308 million, divided as follows:
 - 83.2 million Children under age 19
 - 82 million Young Adults aged 20-39
 - 104.8 million Older Adults aged 40 to 65
 - 37.5 million Elderly Adults aged 66+ (currently receiving Social Security Retirement funds)
- The Social Security Fund in 2010 had assets of \$2.3 trillion.

2. Now consider the future. What happens if current policies and population aging trends continue? To find out, run the simulation without making any changes. Record the year the Social Security Fund goes bankrupt.

2041 (This is based on the model assumptions stated above.)

3. Review options:

- (a) Change taxes from the current level of 6.2% of wages.
- (b) Change the annual average benefit (\$15,000 in 2010 dollars).
- (c) Raise the age when benefits begin to 70.

Explore each using the tables below. Begin with modest change and run the scenarios specified. If advised, “You’re running out of money,” you may increase the level of change. Record results below.

Option:	Other Changes? Year?	Year Sim Ends	Is Fund Bankrupt?	Ending Workforce (in millions)	Ending # SS Recipients (in millions)
Raise Taxes to 6.8% of wages		2054	yes	112	77
Reduce Annual Average Benefit to \$14000		2052	yes	114	75
Raise Pension Age to 70		2060	no	123	62

Review and compare your results. Summarize what you have learned on the next page.

Modest increases in taxes or reductions in benefits will extend the life of the fund, but will not sustain it through 2060. Furthermore, the longer policymakers delay in finding a solution, the greater the crisis (as the Social Security Fund grows smaller, even drastic options in raising taxes or slashing benefits will not work). A more substantial change, extending the starting date for receiving a pension to age 70 (from the current 66 or 67) will keep the fund solvent through 2060.

Next, experiment with other options you choose to keep the Social Security Fund solvent until 2060. Record three successful strategies below.

	Set FICA Tax % at:	Set Average Benefit at:	Set Retirement Age at:	Fund Value in 2060 (in trillions)
Strategy 1				
Strategy 2				
Strategy 3				

Student experimentation with options should reveal that:

1. significant increases in taxes or significant reductions in benefits, introduced immediately, will keep the fund solvent. Each, however, can be expected to generate significant political opposition.
2. a combination of modest tax increases (up from 6.2 to 6.8%, for instance) and reduced annual benefits (down from \$15,000 to \$14,000) would also work.

Run the three strategies one after the other without clicking the “Reset” button. Use Page 1 of each graph to compare the health of the fund and the number of recipients in each case. Now evaluate: Which strategy would you, as a policymaker, be willing to recommend? Assuming your decision may be unpopular among workers, Social Security recipients, or both, explain your decision. What factors caused you to choose the variable(s) you changed?

This question is intended to highlight the fact that there is no one, single, right answer. Instead, there are trade-offs where overall costs and benefits may be borne by different groups of Americans. Will workers accept higher taxes and, if so, how will that bear on their expectations when they retire? Alternatively, will retirees who have paid into the fund be willing to accept less in order to keep Social Security for coming generations? Or will those who are preparing to retire be willing to postpone receiving their pensions to age 70?

The point is that the current and future dynamics of Social Security Fund resources are influenced by America’s long-term population dynamics, including a baby boom that happened decades ago.

STEP 4. Put the Pieces Together

1. Why should baby booms be seen as long-term phenomena, with effects lasting longer than the period of increased birth rates?

Birth rates within a population have long-term influences in shaping the character of a given population over time. Where the rates are temporarily high, the presence of a baby boom cohort will continue to impact social (political, economic, cultural) and environmental conditions over the course of their lives, in different ways at different times.

2. How can we use our understanding of population dynamics to inform policy decisions? How do those decisions help sustain programs like Social Security in the long term?

Population dynamics can and should be monitored and modeled to anticipate future policy needs and, as shown in this simulation, to act on those needs before they reach crisis proportions. As population dynamics are always changing, policymakers need to consider their implications and be proactive in devising thoughtful and balanced decisions. Too often, crises lead to short-term reactions which rarely yield long-term balanced solutions.

3. What other aspects of U.S. life or public policy might the baby boom affect in the future, besides the U.S. Social Security Fund?

Medicare, another example of social programming referred to as a “safety net” for elderly Americans, will also feel the impact of aging baby boomers. Retiring boomers are also likely to have an impact on larger economic issues, for instance, relating to American job and employment needs (e.g., engineers, scientists, professionals), and patterns of regional development (e.g., shifting populations to the Sun Belt and retirement housing).

4. Many other developed nations in the world (e.g., in Western Europe, Japan) have similar issues associated with aging populations. Are there recommendations you might have for them?

Western Europe and Japan’s falling birth rates exceed that of the U.S. and translate into actual falling overall populations. Like the U.S., these countries face shrinking workforces and growing numbers of elders/retirees.

Again, there is no right answer, but rather a need to review options and determine trade-offs that distribute costs and benefits in ways that are deemed most beneficial and fair by their respective populations.

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- (c) Raise the age when benefits begin to 70.

Explore each using the tables below. Begin with modest change and run the scenarios specified. If advised, “You’re running out of money,” you may increase the level of change. Record results below.

Option:	Other Changes? Year?	Year Sim Ends	Is Fund Bankrupt?	Ending Workforce (in millions)	Ending # SS Recipients (in millions)
Raise Taxes to 6.8% of wages					
Reduce Annual Average Benefit to \$14000					
Raise Pension Age to 70					

Review and compare your results. Summarize what you have learned on the next page.

Next, experiment with other options you choose to keep the Social Security Fund solvent until 2060. Record three successful strategies below.

	Set FICA Tax % at:	Set Average Benefit at:	Set Retirement Age at:	Fund Value in 2060 (in trillions)
Strategy 1				
Strategy 2				
Strategy 3				

Run the three strategies one after the other without clicking the “Reset” button. Use Page 1 of each graph to compare the health of the fund and the number of recipients in each case. Now evaluate: Which strategy would you, as a policymaker, be willing to recommend? Assuming your decision may be unpopular among workers, Social Security recipients, or both, explain your decision. What factors caused you to choose the variable(s) you changed?

STEP 4. Put the Pieces Together

1. Why should baby booms be seen as long-term phenomena, with effects lasting longer than the period of increased birth rates?
2. How can we use our understanding of population dynamics to inform policy decisions? How do those decisions help sustain programs like Social Security in the long term?
3. What other aspects of U.S. life or public policy might the baby boom affect in the future, besides the U.S. Social Security Fund?
4. Many other developed nations in the world (e.g., in Western Europe, Japan) have similar issues associated with aging populations. Are there recommendations you might have for them?