

Teaching Notes
Lesson 6
Looking Back at the Shapes of the United States

Overview:

This lesson looks back at the United States population using pyramid graphs and histograms from 1980 to 2015. Many current issues and challenges are a direct result of generational differences regarding lifestyle choices, entertainment choices, use of technology, and financial priorities. The generational labels most commonly used in this lesson (Baby Boom Generation, Generation X, Millennials) are traced back in time using the population graphs. Students interpret census data involving past and current counts to speculate why a generational study is important in understanding the demographic make-up of the United States.

Percentages of the various generations are derived over time that uncover factors that explain a change in a population distribution (for example, immigration and death). As students uncover the factors of change, carefully monitor class discussion. Explaining these factors (particularly those that summarize immigration and death) are mature topics that some students may be uncomfortable discussing in class. They are also topics, however, that result in students discovering mathematical tools that are needed in constructing models that look into the future.

This lesson poses several ideas that complement the goal of looking back by analyzing the count of selected age groups. Consider ways for your students to communicate with people of different generations. One extension that was implemented involved an activity of interviewing parents or grandparents or guardians. Students should provide you details before they conduct the interview so you can give them feedback. Some extensions that were also implemented involved students watching old television shows or reading portions of older novels that were popular in the 1950s or 1960s as ways to understand the lifestyle and values of Baby Boomers. Here again, however, a cautionary note is given. Some old television shows resulted in negative feedback regarding racial and gender issues. For some students and classes this is not a recommended extension as the topics were uncomfortable for students to discuss or share in their class. For other students or classes, however, this added to the value of what students were learning about the background of different generations. This activity also provided an opportunity to discuss with family members and friends important topics that have changed over time. If this extension is conducted, be aware of the topics that might be discussed, and monitor these discussions closely.

An alignment of the problems in this lesson to the **Modeling Continuum** are suggested in the following table:

Modeling Continuum Classification			
Level 1	Level 2	Level 3	Level 4
Problems:	Problems: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 18	Problems: 12, 13, 14, 15, 16, 19	Problems: 17

Primary tools students use in this lesson to answer the above problems are:

Arithmetic operations, proportions, percent, extracting and interpreting data from graphs
See the connection of these tools to high school standards in the ***Overview of the Module***.

Resources needed for this lesson:

Provide a copy of the **Introduction** to Unit 2 and a complete Lesson 6 for each student. This lesson does not require any additional handouts.

Launch:

Begin by reading and discussing the **Introduction** to Unit 2. Discuss with students that the statement “The History of America’s Future” (also the title of a book by Strauss and Howe that is referenced in the lesson) is a summary of this unit. Mathematics will be used to uncover the past and analyze the future.

After a brief discussion of the introduction, direct students to individually study the 1980 and the 2015 pyramid graphs and histograms that are used to begin the lesson. Ask students to comment on what is different about the shapes of the graphs. Also ask them to think about identifying people counted in 1980 and also counted in 2015. What part of the population of 2015 includes people counted in 1980 and what part of the population in 2015 are new people? The problems in the lesson address these differences in more detail, however, it is likely that an opening discussion will set the stage for understanding the problems that ask students to study the changing counts, shapes, and demographics of the United States over time.

Implementation Ideas:

The differences in the counts of people connected to various age groups are emphasized in the problems, with some age groups having a more dominant count and percent than others. Students connect the counts with generational labels that are frequently used in analyzing the United States population. These labels (specifically the Silent Generation, the Baby Boom Generation, Generation X, and the Millennial Generation) are connected to periods of time in which these generations were born. Encourage students to conduct some research regarding generations. Please monitor their resources. There are significant summaries from polls, surveys, economic data, and health care data that use these labels as a way to explain

differences or similarities of the various generations. Also consider assigning students a topic mentioned in the lesson (for example, musical preferences or movies) and research the preferences cited by various age groups or generations.

Extension

Consider the following extension to the research mentioned above. As a class, design a short survey that students use to collect data from their parents or guardians and other family members of different ages. Questions on the survey might include preferences in music, movies, games or entertainment. In addition, survey questions might ask people to indicate who they consider as the most influential people in the country (or state or city or town), what daily activities are important, or what problems are considered the most critical in the country. Include on the survey a question to determine the age or an age group of the person completing the survey. Organize a short time period in which the surveys are given out so that there is some consistency in the responses collected. Use the data as a way to reflection on what are possible factors that impact people from different generations.

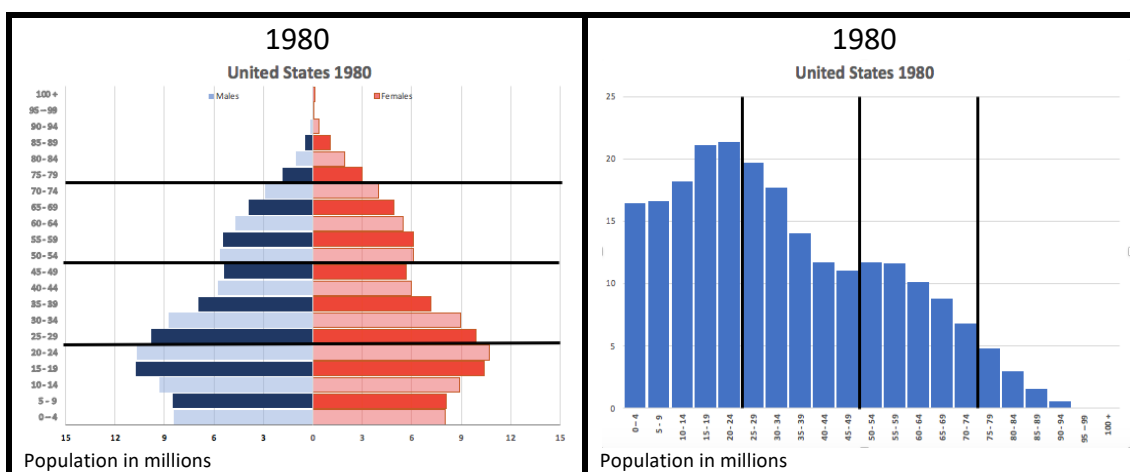
Discuss with students that the results from the surveys, however, do NOT necessarily reflect characteristics of a generation due to challenges of obtaining a representative sample. Students should not report what they compiled from the surveys or interviews as a statistical summary of generations but rather as a type of class project or case study. Students may, however, learn insights that a statistical study would need to consider. Young and emerging adults (or students completing this extension) valued the reflections received from people of other generations.

Student responses or descriptions

Lesson 6 - Problems

1. Lesson 1 defined the age group layers (bottom-layered, lower middle-layered, upper middle-layered, and top-layered) for the 2015 pyramid graph or histogram. Based on the percent of people in each layer, the United States was identified as a lower middle-layered country in 2015. Identify the layers in the 1980 pyramid graph and the 1980 histogram similar to the way they are identified in the 2015 graphs.

Students identify the 0 to 24 years old age groups as the bottom layer, 25 to 49 years old age groups as the lower middle-layer, 50 to 74 years old age groups as the upper middle-layer, and the 75 to 100+ years old age groups as the top layer.

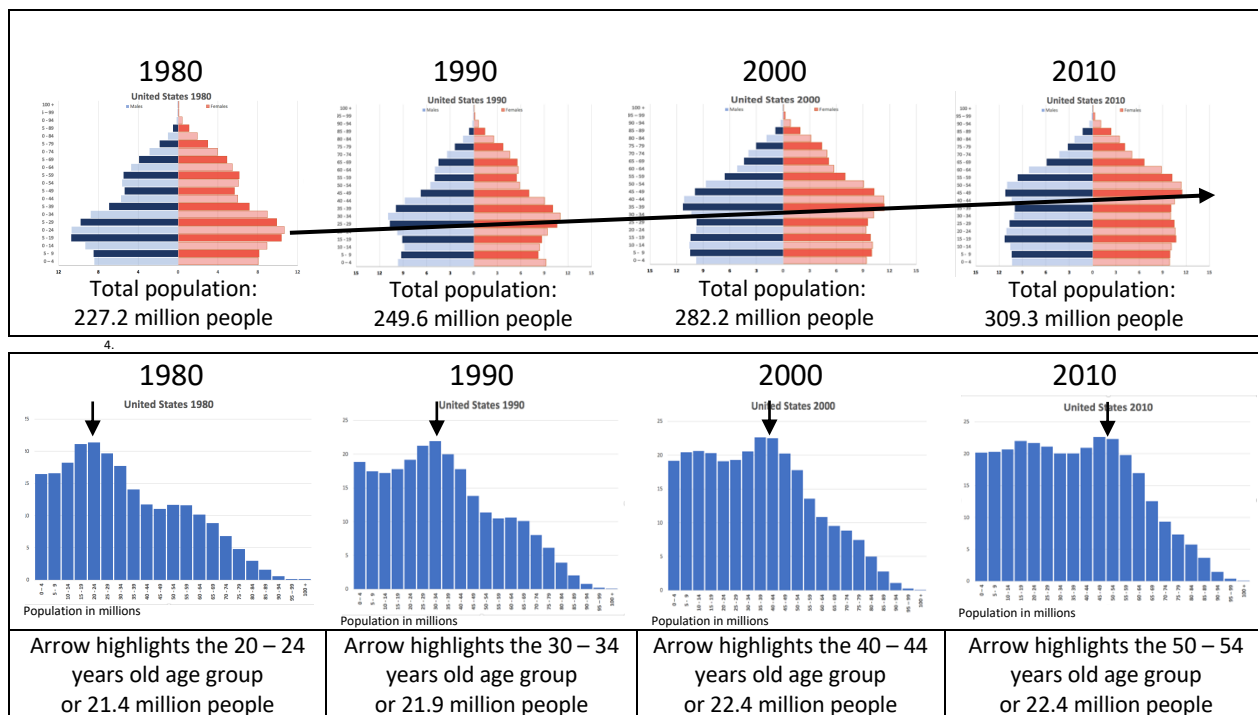


2. Based on the layered marks, what identification would summarize the shape of the country in the year 1980? Which graph, the pyramid graph or the histogram, did you use to make your identification? Explain why you selected the graph you identified.

The 1980 population is bottom-layered. (Allow students to estimate this identification based on the area of the graph that is marked off in that layer. The percent of the population in the bottom layer is 41.3% of the population.)

Either the pyramid graph or the histogram could be identified to answer the question about the change in the shape. The scale for the 1980 and the 2015 pyramid graph are the same, so the change in the area of the graphs and the changes in the length (or counts) of corresponding age groups can be used to compare overall changes between 2015 and 1980. The scales are also the same for the histograms. Most students selected the histogram when field testing this problem, but their reasons were focused more on the appearance and not the scales. This question is more important in the next lesson as the scales of the pyramid graphs are not the same, thus, comparing graphs is more challenging.

3. The change in the shape from 1980 to 2015 is highlighted by observing the aging of certain age groups over two to three decades. The arrows sketched on the following pyramid graphs and histograms trace the aging of people who were 20 – 24 years old at the start of 1980 through three decades. What is significant about this age group in 1980?



The significance is that the age group highlighted in 1980 was the largest age group in the 1980 graphs. As the people in this age group grew older, the shape of the country also changed as the lower middle layer increased in the count of people.

4. Based on the above timeline, the people 20 - 24 years old in 1980 would be counted in the 30 – 34 years old age group of the 1990 Census if they did not move out of the country or die. What is significant about the count of the 30 – 34 years old age group in 1990?

The significance is again that the count of people in the 30 – 34 years old age group in 1990 was the largest age group in the graphs. Highlight that during the ten years from 1980 to 1990, the people counted as 20 – 24 years old in 1980 and then counted as 30 – 34 years old in 1990 remain as the most dominant age group in the country. Also note that the count of 30 – 34 years old in 1990 is greater than the count of 20 – 24 years old in 1980. More people were added to that group over the ten years. The only way that count could increase is immigration – a factor that will be part of the projection models developed in Unit 3.

5. Observe that the people 20 – 24 years old in 1980 are counted in the 40 – 44 years old age group in the 2000 census if they did not move out of the country or they did not die. Did the count of people in the 40 – 44 years old age group in 2000 increase, decrease, or stay the same when compared to the count of people in the 20 – 24 years old age group in 1980? Explain what happened during the 20 years from 1980 to 2000 that might increase or decrease the count of people 20 – 24 years old in 1980 to the count of people 40 – 44 years old in 2000.

The count of people increased for that 5-year age group of people from 1980 to 2000 by approximately 1 million people. The increase was a result of more people moving into the country than people dying or moving out of the country.

6. Calculate the following based on the above pyramid graphs and histograms highlighted in this lesson:

- a. What percent of the population in 1980 were 20 – 24 years old?

$$21.4 / 227.2 = 0.094 \text{ or } 9.4\%$$

- b. What percent of the population in 1990 were 30 – 34 years old?

$$21.9 / 249.6 = 0.088 \text{ or } 8.8\%$$

- c. What percent of the population in 2000 were 40 – 44 years old?

$$22.4 / 282.2 = 0.079 \text{ or } 7.9\%$$

- d. What percent of the population in 2010 were 50 – 54 years old?

$$22.4 / 309.3 = 0.072 \text{ or } 7.2\%$$

- e. The count of people in 2015 who were 55 – 59 years old was 21.8 million people. What percent of the population in 2015 were 55 – 59 years old?

$$21.8 / 320.9 = 0.068 \text{ or approximately } 6.8\%$$

7. Recall that for this module, the count of people in an age group is based on ages **at the start of the year**. Therefore, a person born in 1943 was counted as a one-year old at the start of the 1945 United States Census count, although this person turned two years old sometime in 1945. If this person continued to live in the United States, he or she was six years at the start of 1950 and turned seven sometime in 1950. Based on that interpretation of the age groups represented in the graphs, answer the following:

- a. What was the age of a person whose birth year is 1943 at the start of 2015?

There are several ways students discovered how to calculate the age. One method was to subtract the two given years, and then subtract 1 from the answer addressing the fact that the person did not have a birthday in the last year (in this case, 2015).

For this question:

$2015 - 1943 = 72$. Subtract 1 as this person will turn 72 sometime in 2015, the age would be 71 years at the start of 2015.

- b. What was the age of a person whose birth year is 1960 at the start of 2015?

$2015 - 1960 = 55$. Subtract 1 or 54 years.

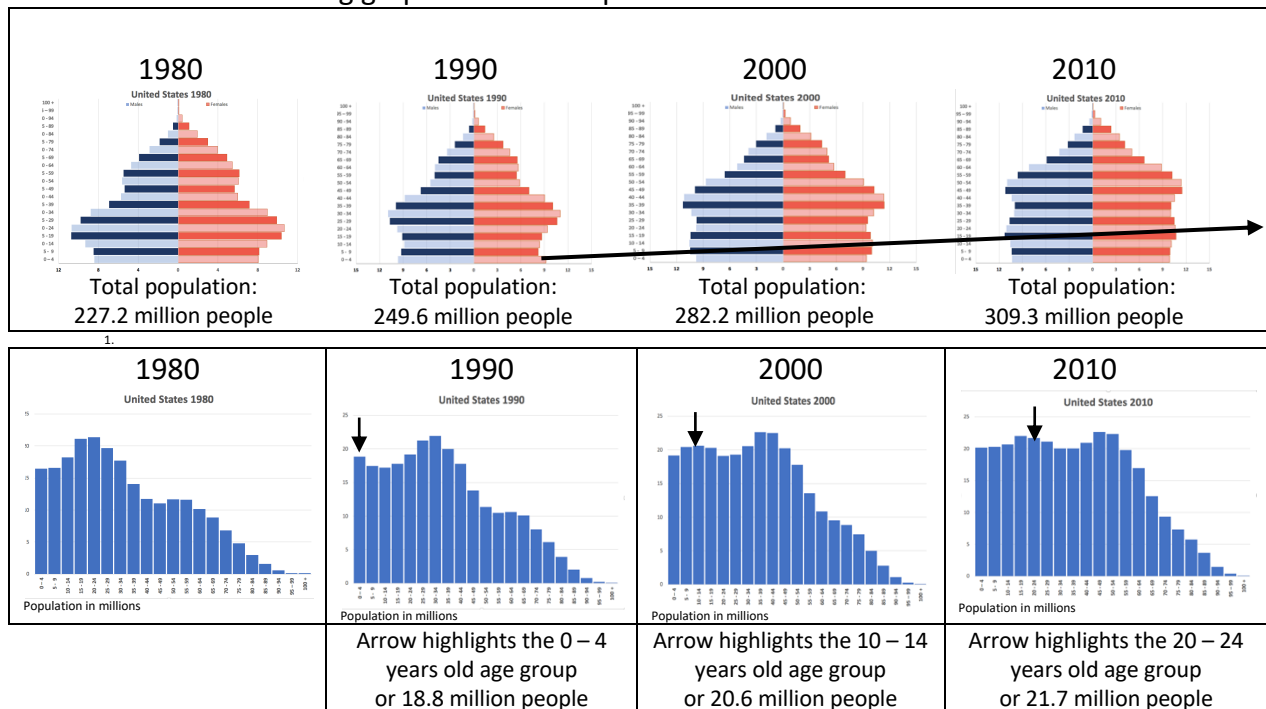
- c. What age groups in the 2015 population graphs would include most of the people born in 1943 to 1960?

The oldest age group of 70 – 74 years to the youngest age group of 50 – 54 years old. Students may reason that the youngest group is 55 – 59 as there is only 1 group in the 50 – 54 years old, or the people 54 years old, who would belong to the Baby Boom generation as identified in this lesson. As the years identifying generations are debated among researchers, also allow that answer to identify the aging Baby Boom Generation.

- d. What do the population graphs from 1980 to 2010 indicate is happening to the Baby Boom Generation?

The counts and the percent of this group is declining. They still indicate a major count of people, but the percent in these age groups is declining due to death or possibly people leaving the country.

Students use the following graphs to answer questions 8 to 10.



8. What is significant about the 0 – 4 years old age group in 1990?

The count of 0 – 4 years old is greater than the count of several of the older age groups, specifically the 5 – 9 years old, 10 – 14 years old, and the 15 – 19 years old age group.

9. People 0 – 4 years old at the start of 1990 (or born in 1985 to 1989) would be 20 - 24 years old at the start of 2010 if they remained in the country or did not die. Did the count of people in the 0 – 4 years old age group in 1990 increase, decrease, or stay the same when compared to the count of people in the 20 – 24 years old age group in 2010? Explain what might increase or decrease the count of the people who were 0 – 4 years old in 1990 and then 20 – 24 years old in 2010.

The count of people increased nearly 3 million during that time. This is again explained by immigration. Some people during that time died or moved out of the country (which decreased the count). The overall increase is explained by more people within the ages of this age group moving into the country.

10. Calculate the following based on the pyramid graphs or the histograms:

- a. What percent of the population is 0 – 4 years old in 1990?
 $18.8 / 249.6 = 0.075$ or 7.5%
- b. What is the percent of the population 10 – 14 years old in 2000?
 $20.6 / 282.2 = 0.073$ or 7.3%
- c. What is the percent of the population 20 – 24 years old in 2010?
 $21.7 / 309.3 = 0.070$ or 7%

11. Kristin was directed by the administrators at the health clinic to write a report highlighting the changes of the United States population by ages from 1980 to 2015. Which one of the following summaries would be appropriate for her report based on the descriptions of the Baby Boom Generation and the Millennial Generation in the previous problems? Explain why you think your selection is the most accurate.

- a. The Baby Boom Generation is growing in numbers.
- b. The Millennial Generation is catching up to the Baby Boom Generation.
- c. The Millennial Generation is decreasing in numbers.
- d. The percent of the United States population in 2010 who are considered the Baby Boom Generation and the Millennial Generation is less than most other age groups.

The answer is b. The Baby Boom Generation is showing a leveling off of the counts during that time. The Millennial Generation is still increasing in counts. The percent of the primary age groups of the Baby Boom Generation is also decreasing (as well as the percent of the primary age groups of the Millennial Generation), but the decreases indicate that in 2015 the percentage of the primary age group of the Baby Boom Generation is less than the primary age group of the Millennial Generation highlighted the histograms and pyramid graphs.

12. Why are these two generations (Baby Boom Generation and the Millennial Generation) important in understanding the United States in the following areas:

- a. entertainment watched on TV or cable or streaming services?
A major generational divide is frequently reported regarding how people receive their entertainment. At the time of the writing of this module, mostly older people (the Baby Boom Generation) prefer cable and/or regular TV. The younger generations (the Millennials) prefer streaming services. These preferences, however, are constantly changing.

- b. musical preferences?

Musical preferences are often summarized as generational preferences (this is an opinion by many and may or may not be true). As a result, the impact of these generations on the musical business is significant.

- c. movies?

Similar to the answer to b, the impact of these generations on the movie industry is significant due to the greater count of people in these age groups.

- d. health care?

The Baby Boom Generation is reaching the ages in which health care is a major concern. Millennials at this time are likely not as concerned (as research indicates that the majority of the Millennials are still at the age in which they are generally healthy). The tension between these two groups over this issue in 2015 was significant.

13. Let us return to the characters of the data stories in this module. Complete the following table (Kristin has been completed for you):

	Age at start of 2015	Birth year	Age at start of 1980	Generation
Kristin	36	1978	1	Generation X
Abbey (Kristin's sister)	26	1988	<i>Was not born yet.</i>	Millennial
Kristin's mother	66	1948	31	Baby Boomer

Observe the answers in the above table.

14. Answer the following:

- a. In what age group did Kristin's mother belong in the 1980 population histogram?

Kristin's mother belonged to the 30 – 34 years old age group in 1980.

- b. In what age group did Kristin belong in the 1980 population histogram?

Kristin belonged to the 0 – 4 years old age group in 1980.

15. Use the 2015 population histogram to answer the following:

- a. Identify the three age groups immediately younger than Kristin's age group in 2015. Are the counts in these age groups greater than or less than the count in Kristin's age group?

The counts in the 2015 population pyramid graph or the 2015 histogram of the 3 age groups immediately younger than Kristin are 30 – 34 years old, 25 – 29 years old, and 20 – 24 years old. Each of these age groups has a greater count than the count in Kristin's age group. The count of 20 – 24 years old is greater than the count of 25 – 29 years old. And, the count of 25 – 29 years old is greater than the count of 30 -34 years old.

- b. Identify the three age groups immediately younger than Kristin's mother's age group in 2015. Are the counts in these age groups greater than or less than the count in her mother's age group?

The counts in the 2015 population pyramid graph or the 2015 histogram of the 3 age groups immediately younger than Kristin's mother are 60 – 64 years old, 55 – 59 years old, and 50 – 54 years old. Each of these age groups is also greater than the count in her mother's age group. The count of 50 – 54 years old is greater than the count of people 55 – 59 years old. And, the count of 55 – 59 years old is greater than the count 60 – 64 years old.

16. In what age group was Abbey counted in 2015?. Identify the three age groups immediately younger than Abbey's age group in 2015. Are the counts in these age groups greater than or less than the count in Abbey's age group?

Abbey was counted in the 25 – 29 years old age group in 2015. The age group 20 – 24 years old is greater in count than her age group. However, the counts in the 15 – 29 years old and the 10 – 14 years old are less in count than her age group.

17. Kristin's mother was 30 years old when Kristin was born and 40 years old when Abbey was born. Members of the Baby Boom Generation generally had children at an older age than people in the generations older than the Baby Boom Generation. In what way did the decision of Baby Boomers to have children at an older age possibly impact the counts of people in age groups that included Kristin's age group and 3 age groups immediately younger than Kristin's age group?

The decision to have children at an older age may have contributed to the increase in the counts in the age groups younger than Kristin's age group as her mother represents one of the older members of the Baby Boomers.

18. Determine the percent change in the age groups from 1980 to 2015 by completing the following table (round off the percent increases to the nearest tenth of a percent):
(Consider assigning completion of this table in small groups.)

Age Group	1980 Population	2015 Population	Percent change from 1980 to 2015
0-4	16,451,184	19,912,499	$(19,912,499 - 16,451,184)/16,451,184$ $0.210 = 21.0\%$
5-9	16,602,353	20,481,130	$(20,481,130 - 16,602,353)/16,602,353$ $0.234 = 23.4\%$
10-14	18,236,335	20,605,579	$(20,605,579 - 18,236,335)/18,236,335$ $0.130 = 13.0\%$
15-19	21,110,940	21,084,710	$(21,084,710 - 21,110,940)/21,110,940$ $-0.0012 = -0.12\%$
20-24	21,385,705	22,693,026	$(22,693,026 - 21,385,705)/21,385,705$ $.061 = 6.1\%$
25-29	19,685,966	22,401,168	$(22,401,168 - 19,685,966)/19,685,966$ $0.138 = 13.8\%$
30-34	17,742,706	21,617,533	$(21,617,533 - 17,742,706)/17,742,706$ $0.218 = 21.8\%$
35-39	14,076,734	20,312,646	$(20,312,646 - 14,076,734)/14,076,734$ $0.443 = 44.3\%$
40-44	11,728,497	20,156,736	$(20,156,736 - 11,728,497)/11,728,497$ $0.719 = 71.9\%$
45-50	11,048,040	20,801,156	$(20,801,156 - 11,048,040)/11,048,040$ $0.883 = 88.3\%$
50-54	11,694,715	22,289,734	$(22,289,734 - 11,694,715)/11,694,715$ $0.906 = 90.6\%$
55-59	11,611,382	21,767,855	$(21,767,855 - 11,611,382)/11,611,382$ $0.875 = 87.5\%$
60-64	10,142,668	19,038,554	$(19,038,554 - 10,142,668)/10,142,668$ $0.877 = 87.7\%$
65-69	8,809,479	16,049,246	$(16,049,246 - 8,809,479)/8,809,479$ $0.822 = 82.2\%$
70-74	6,841,235	11,477,776	$(11,477,776 - 6,841,235)/6,841,235$ $0.678 = 67.8\%$
75-79	4,829,832	8,119,847	$(8,119,847 - 4,829,832)/4,829,832$ $0.681 = 68.1\%$
80-84	2,955,279	5,798,910	$(5,798,910 - 2,955,279)/2,955,279$ $0.962 = 96.2\%$
85-89	1,580,234	3,864,289	$(3,864,289 - 1,580,234)/1,580,234$ $1.445 = 144.5\%$
90 - 94	557,241	1,851,620	$(1,851,620 - 557,241)/557,241$ $2.3228 = 232.28\%$
95 – 99	119,057	495,362	$(495,362 - 119,057)/119,057$ $= 316.07\%$
100+	15,099	77,242	$(77,242 - 15,099)/15,099$ $4.1157 = 411.57\%$
Totals	227,224,681	320,896,618	$(320,896,618 - 227,224,681)/227,224,681$ $0.4122 = 41.22\%$

Note: After students complete the blank cells of the table, discuss with them a summary of the percent changes. Students should observe that in most cases there is an increase in the percent change of older age groups. The table indicates how the country grew over this period of time. It also indicates how the country grew older.

19. Identify age groups that you would like to follow as projection estimates are derived in the following lessons. Why are you interested in these age groups?

This problem is optional. A student might want to continue to watch an age group that is part of one of the identified generation labels (Baby Boomers, Generation X, Millennial) to see how the counts change over time.

Assessment Ideas:

Consider an assessment that has students write a 3 or 4-sentence summary on what happened to an age group from 1980 to 2015. In this summary, students should highlight the changes in the percent of this age group, changes in the count and percent of age groups above and below this age group, and changes in the shape of the country over this period of time. If a student highlights an age group that was dominant in 1980, does this age group remain dominant in 2015? Or, if a student highlights an age group that was not as dominant in count in 1980 or other decades, does its impact change over the decades?