Topic 9: Ecology – 9a. Population
9a1. Age–Gender Distribution Lab

Resources: Miller, K., Levine, J. (2004). *Biology.* Boston, MA: Pearson Prentice Hall.

International Population Data Base [Internet]. U.S .Census Bureau. 2009. Available from: http://www.census.gov/ipc/www/idb/informationGateway.php

Poodwaddle World Clock [Internet]. Poodwaddle. Cited 3 Aug. 2009. Available from: http://www.poodwaddle.com/worldclock.swf

Building on: *Population growth* is dependent on *natality, mortality, immigration,* and *emigration.* Many factors affect natality and mortality including available health care, diet, and housing. They are also influenced by economic factors like schooling, type of economy, availability of birth control and child care. More developed countries have a lower mortality, but generally have a lower natality. A population with many individuals of *reproductive age* has potential for growth, aswas seen when the post-World War II baby boomers reached reproductive age. A disproportionate number of *one gender,* especially males, will reduce growth rate as seen in many war torn countries.

Predicting future population growth is both a guessing game and a science. The use of age-gender distribution for a population is an important component of that prediction.

Links to Chemistry and Physics: Future projections

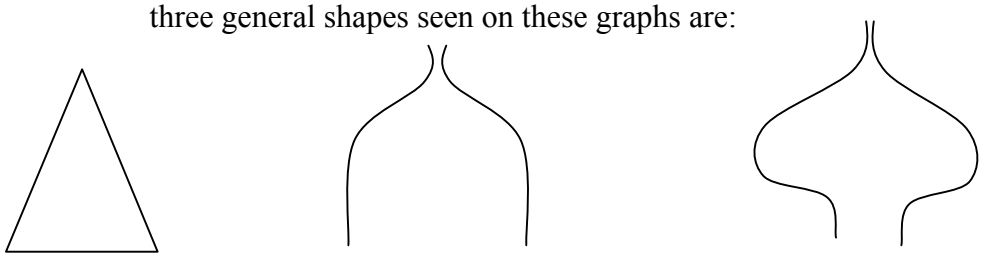
Stories: Above I have included a web link to the Poodwaddle world clock.

You can project this clock up on a screen in your room while students are working on their lab. Slowly they will start watching the clock. You can change the clock to different statistics and the students will be amazed to find out how many people die from cardiovascular disease as opposed to cancer. The most common reason from death by injury is traffic accidents. How large the death rate is for malaria and how much of the human meat diet comes from chickens. It also included data about the U.S. national debt, and how many e-mail scams are sent out daily.

It is a rather dramatic view of population and human population changes. It does require that you have Shockwave and Flash players on your computer.

Ecology
Age-Gender Population Graphs: Predicting Growth

Introduction: An age-gender population graph is a unique bar graph that shows you the % of males and the % of females in each age bracket of a particular population. It can be used to help predict the future growth of that population. This type of graph is sometimes called a population pyramid, but that is misleading because the shape of the graph is not always a pyramid (triangle) shape. The three general shapes seen on these graphs are:

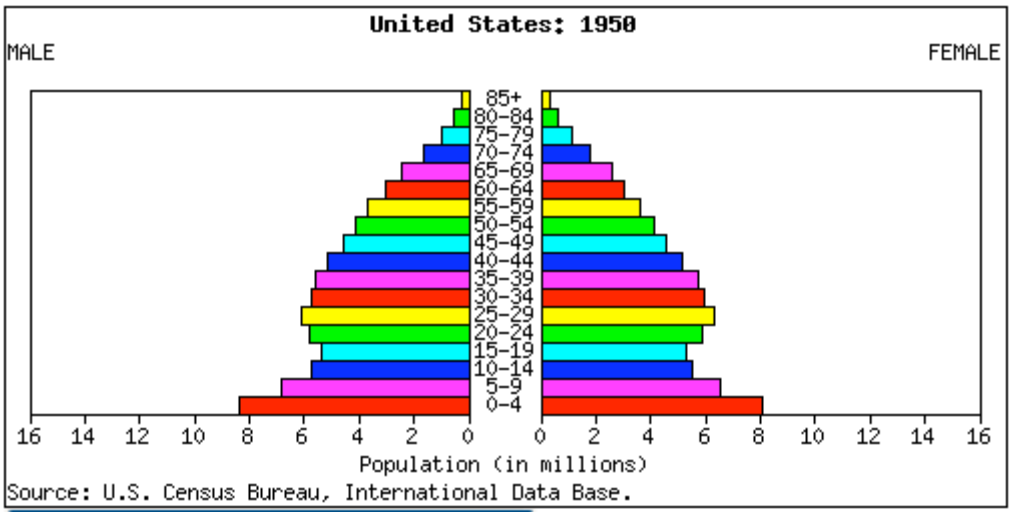


Pyramid Bell Jar Onion Dome

These graphs are really like to bar graphs on their sides. One side represents the males and the other side represents the females.

Hypothesis 1: Which shape graph do you think represents the fastest growing population and why?

Below is an example of an age-gender population graph for the U.S. in 1950.



Hypothesis 2: You are going to be constructing and examining the age-gender relationship of five different countries: Afghanistan, China, Ethiopia, Italy, and the United States. The growth rates (%) for these countries, in no particular order are:

3.0, 1, -1.5, 0.7, and 0.3. Which growth rate do you think goes with which country and why?

Procedure: You will find a table at the end of this lab with the % of males and females for each five-year age bracket for the five countries to be analyzed. All percentages should be rounded to the nearest whole number. Using graph paper you need to construct a graph, following the example given, for each of the countries. When you have completed the graphs, ask your teacher for the correct growth rate for each country. Answer the analysis questions and write a conclusion.

Analysis Questions:

1. Population growth is supposed to be determined by natality (birth), mortality (death), immigration and emigration. Explain what the age–gender graphs can tell you about the mortality rate of a particular country.

2. What are two aspects of the age-gender graph that would indicate that there will be a lot of growth in a country?

3. How could you explain a country that has a large population between the ages of 20 and 35 and still has a low growth rate? Give three variables that might be responsible for this situation.

4. Hypothesize an explanation for the growth rate in Afghanistan.

5. Based on your data and the growth rates, which graph shape represents the most growth? Which is declining growth and which is stable growth?

Age–Gender Data for Afghanistan, China, Ethiopia, Italy, and the United States

	Afghanistan		China		Ethiopia		Italy		United States	
	% for Each Age Bracket		% for Each Age Bracket		% for Each Age Bracket		% for Each Age Bracket		% for Each Age Bracket	
Age Brackets	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
0 - 4	19.6	19.7	7.7	7.2	18.3	17.7	4.8	4.3	3.5	3.3
5 - 9	15.6	15.5	8.3	8	14.7	14.4	5	4.5	3.7	3.5
10 - 14	12.4	12.3	10	9.8	13	13.2	5.1	4.6	3.7	3.6
15 - 19	9.6	9.5	8.1	8.1	11	11.1	5.5	4.9	3.7	3.5
20 - 24	8.5	8.3	7.5	7.6	9	9	6.7	6.1	3.5	3.3
25 - 29	7.3	7.3	9.3	9.4	7.4	6.9	8.4	7.6	3.5	3.4
30 - 34	6.1	6	9.8	9.9	5.7	5.6	8.8	8	3.7	3.6
35 - 39	5.1	5	8	8.1	4.7	5	8.5	7.8	4.0	4.0
40 - 44	4.1	4.1	6.5	6.4	4	4.1	7.3	6.8	4.0	4.0
45 - 49	3.3	3.4	6.6	6.6	3.3	3.3	6.7	6.4	3.5	3.6
50 - 54	2.6	2.7	4.8	4.8	2.7	2.6	6.7	6.6	3.1	3.2
55 - 59	2	2.1	3.7	3.6	2.1	2.3	5.7	5.7	2.3	2.5
60 - 64	1.5	1.6	3.2	3.2	1.5	1.8	5.7	6	1.8	2.0
65 - 69	1	1.1	2.7	2.8	1.1	1.3	5	5.6	1.6	1.8
70 - 74	0.6	0.7	1.9	2.1	0.8	0.9	4.3	5.2	1.4	1.8
75 - 79	0.3	0.4	1.1	1.4	0.4	0.5	3.2	4.6	1.1	1.6
80 - 84	0.1	0.1	0.5	0.8	0.2	0.2	1.4	2.4	0.7	1.1
85 - 89	0	0	0.2	0.3	0	0.1	1	2	0.3	0.7
90 - 94	0	0	0	0.1	0	0	0.3	0.7	0.1	0.3
95 - 99	0	0	0	0	0	0	0	0.1	0.0	0.1
100 +	0	0	0	0	0	0	0	0	0.0	0.0