
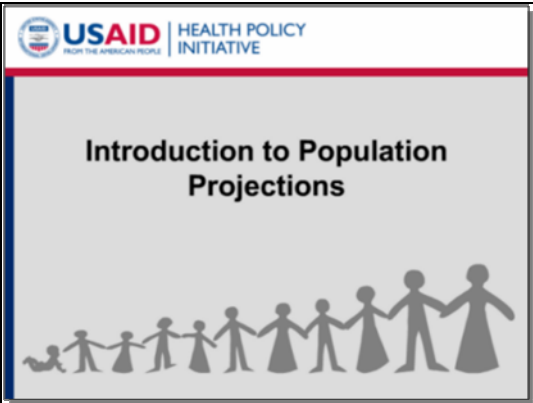
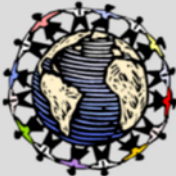


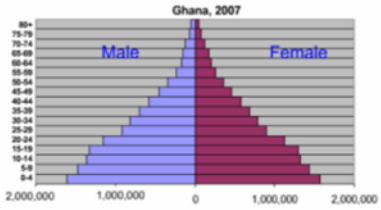


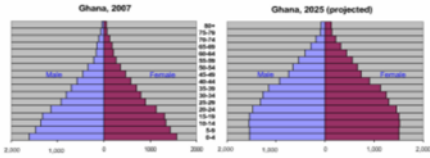
Handout for Part 1


Introduction to Population Projections



Slides	Slide Content	Closed Captions
	<p>Introduction to DemProj an e-learning course</p>	<p>This course is the first e-learning course created by the United States Agency for International Development Health Policy Initiative. My name is John Ross, and I will be your instructor for Part 1. This course was created in response to the demand for technical assistance for use of the suite of models known as Spectrum. The Spectrum software was created by predecessor projects with funding from USAID. The Spectrum models are used as planning tools around the world by policymakers, program managers, students, and people working in the field of public health. This course focuses on the first module of Spectrum—DemProj—which, as its name implies, is used to make population projections based on demographics.</p>
<p>Overview of Course</p> <ul style="list-style-type: none"> • Part 1: Introduction to population projections • Part 2: Introduction to the DemProj model • Part 3: Programmatic applications of DemProj 	<p>Overview of Course Part 1: Introduction to population projections Part 2: Introduction to the DemProj model Part 3: Programmatic applications of DemProj</p>	<p>This course is divided into 3 parts. Part 1 is an introduction to population projections. Part 2 is an introduction to the DemProj Model. Part 3 presents some programmatic applications of DemProj. To begin this course, users should have a basic understanding of Windows software. Spectrum is a Windows-based program that will run in either Windows 95 or higher versions. The Spectrum program requires approximately 16MB of hard disk space. The tutorials that we are about to cover can be installed from a CD or over the web.</p>

 <p>USAID HEALTH POLICY INITIATIVE</p> <p>Introduction to Population Projections</p>	<p>Introduction to Population Projections</p>	<p>The first part of the course is an introduction to population projections.</p>
<p>Objectives</p> <ul style="list-style-type: none"> ▪ The objectives of part 1 of the course are as follows: <ul style="list-style-type: none"> • Introduce basic concepts related to population projections including fertility, mortality and migration • Explain how population projections can be useful decision-making tools for policy makers • Describe principal determinants of population growth • Provide an overview of the impact of AIDS on population growth 	<p>Objectives</p> <p>The objectives of part 1 of the course are as follows:</p> <ul style="list-style-type: none"> ▪ Introduce basic concepts related to population projections including fertility, mortality, and migration ▪ Explain how population projections can be useful decision-making tools for policy makers ▪ Describe principal determinants of population growth ▪ Provide an overview of the impact of AIDS on population growth 	<p>The objectives of Part 1 are as follows: Introduce basic concepts related to population projections, including fertility, mortality, and migration. Explain how population projections can be useful decisionmaking tools for policymakers. Describe principal determinants of population growth. Provide an overview of the impact of AIDS on population growth.</p>
<p>1. Population Projections</p> 	<p>1. Population Projections</p>	<p>The next few slides give an overview of population projections.</p>


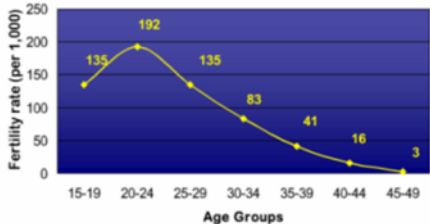
<p>What is a population?</p>  <p><small>Photo taken at the busiest street in Chennai, India. 2002 Vijay Sureshkumar. Courtesy of PhotoShare.</small></p>	<p>What is a population?</p>	<p>Let's start by reviewing what we know about populations.</p>
<p>What is a population?</p> <ul style="list-style-type: none"> ▪ The total number of men, women, boys and girls, of different ages, living in a defined location at a particular point in time  <p><small>© 1987 USIP. Courtesy of PhotoShare. © 1987 Carter-Victor/USIP. Courtesy of PhotoShare. © 1987 Tom Scott/Fox/World International. Courtesy of PhotoShare.</small></p>	<p>What is a population?</p> <ul style="list-style-type: none"> ▪ The total number of men, women, boys and girls, of different ages, living in a defined location at a particular point in time 	<p>A population is the total number of men, women, boys, and girls of different ages, living in a defined location (for example, a city, district, region, or country) at a particular point in time (for example, 2007).</p>
<p>We can illustrate the age structure of a population with a graph called a population pyramid.</p>  <p><small>US Census Bureau, www.census.gov</small></p>	<p>We can illustrate the age structure of a population with a graph called a population pyramid.</p>	<p>We can illustrate the age structure of a population with a graph called a population pyramid, which portrays an age-sex distribution. This pyramid shows the population of Ghana in 2007. A population pyramid is essentially two back-to-back bar graphs: one showing the number of males and one showing the number of females in five-year age groups. Males are conventionally shown on the left and females on the right, and they may be measured by raw numbers or as a percentage of the total population. A great deal of information can be read from a population pyramid to shed light on the extent of a population's development. The wide base indicates a larger number of children, but the rapid narrowing toward the top shows fewer people alive as age increases. This particular pyramid</p>

		<p>is for a population with a high birth rate, a high death rate, and a short life expectancy. This is the typical pattern for less economically developed countries.</p>
<p>We can also estimate what that population will look like in the future.</p> 	<p>We can also estimate what that population will look like in the future.</p>	<p>When we make a population projection, we can estimate what a population will look like at some time in the future and can make comparisons between the pyramids. Notice how the bottom few bands of the population in 2025 are relatively equal. This is due to assumptions about reductions in both the infant mortality rate and the fertility rate.</p>
<p>Population Projection</p> <ul style="list-style-type: none"> ▪ A “best-guess” calculation of the number of people expected to be alive at a future date, based on assumptions about population size, births, deaths and migration. ▪ Always based on a ‘conditional’ future. 	<p>Population Projection</p> <ul style="list-style-type: none"> ▪ A “best-guess” calculation of the number of people expected to be alive at a future date, based on assumptions about population size, births, deaths and migration. ▪ Always based on a ‘conditional’ future. 	<p>A population projection is defined as a “best-guess” calculation of the number of people expected to be alive at a future date, based on what we know about the current population size and what we expect to happen to births, deaths, and migration. Population projections are always set on a “conditional” future because we can never be certain about the assumptions we use in the projection. We can however involve multiple stakeholders and experts in workshops when we make these assumptions.</p>

<p>Why make population projections?</p> <ul style="list-style-type: none"> ▪ Planning <ul style="list-style-type: none"> – Assessing the need for new jobs, teachers, schools, doctors, nurses, urban housing, food, etc. ▪ Policy dialogue <ul style="list-style-type: none"> – Helping policymakers understand that problems exist – Developing solutions 	<p>Why make population projections?</p> <ul style="list-style-type: none"> ▪ Planning <ul style="list-style-type: none"> – Assessing the need for new jobs, teachers, schools, doctors, nurses, urban housing, food, etc. ▪ Policy dialogue <ul style="list-style-type: none"> – Helping policymakers understand that problems exist – Developing solutions 	<p>Why do we make population projections? Population projections are useful for a number of reasons and help stakeholders plan for the near and distant future. If we know how many people are in a country or region, this puts us in a better position to assess the need for new jobs, teachers, schools, doctors, nurses, urban housing, food, and requirements for resources. For example, in order to plan an immunization program at some time in the future, governments, donors, and healthcare staff need to know how many children will be alive in the future. Population projections can help us estimate future population size. Population projections are also important for raising awareness of issues among policymakers. For example, a population projection can help illustrate the impact of an increased population on the use of fuel wood and the potential threat to the forests or the need for affordable housing projects to accommodate the large and growing population.</p>
<p>Summary of Key Population Concepts</p> <ul style="list-style-type: none"> ▪ A population is the total number of men, women, boys, and girls, of different ages, living in a particular place at a particular point in time. ▪ A population pyramid is a graphic representation of the age and sex distribution. ▪ A population projection is an estimate of the number of people expected to be alive at a future date, based on assumptions of population size, births, deaths, and migration. ▪ Population projections are useful tools for program planning and policy dialogue. 	<p>Summary of Key Population Concepts</p> <ul style="list-style-type: none"> ▪ A population is the total number of men, women, boys, and girls, of different ages, living in a particular place at a particular point in time. ▪ A population pyramid is a graphic representation of the age and sex distribution. ▪ A population projection is an estimate of the number of people expected to be alive at a future date, based on assumptions of population size, births, deaths, and migration. ▪ Population projections are useful tools for program planning and policy dialogue. 	<p>In summary, a population is the total number of men, women, boys, and girls of different ages, living in a particular place at a particular point in time. A population pyramid is a graphic representation of the age and sex distribution. A population projection is an estimate of the number of people expected to be alive at a future date, based on assumptions of population size, births, deaths, and migration. Population projections are useful tools for program planning and policy dialogue.</p>




<p style="text-align: center;">2. Fertility</p> 	<p>2. Fertility</p>	<p>Now that we know the basics of population, I'm going to walk you through concepts related to fertility. I'm sure many of you are familiar with measures of fertility, and for some of you, this may be a review. However, it is important to understand these concepts prior to doing an application in DemProj.</p>
<p>Fertility</p> <ul style="list-style-type: none"> ▪ Fertility refers to the number of children born to women. ▪ Fertility is determined by biological and social factors. 	<p>Fertility</p> <ul style="list-style-type: none"> ▪ Fertility refers to the number of children born to women. ▪ Fertility is determined by biological and social factors. 	<p>What is fertility? Fertility refers to the number of children born to women. Why are we concerned with women and not men? Fertility also refers to men, but demographers have found that it is much harder to measure the fertility of men, and therefore, in most cases, fertility is measured in relation to women. Fertility is determined by biological and social factors.</p>
<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ There are several different measures of fertility. ▪ We measure fertility to estimate the number of children that women are having in a given population during a specific time period. ▪ Data for measuring fertility can come from different sources. 	<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ There are several different measures of fertility. ▪ We measure fertility to estimate the number of children that women are having in a given population during a specific time period. ▪ Data for measuring fertility can come from different sources. 	<p>There are several different measures of fertility. You may come across many of these measures in your work, and some find their way into popular newspapers. Familiarizing yourself with them will make you a better consumer of the information, and it will help you better understand fertility trends and levels. Data used to measure fertility and other population processes come from various sources. Some of these sources may produce more complete information than others. The more information you have, the more accurate your estimates will be. Some common sources for finding fertility rates include: national fertility surveys, Demographic and Health Surveys, Centers for Disease Control and Prevention (CDC) Reproductive Health Surveys, the Population</p>

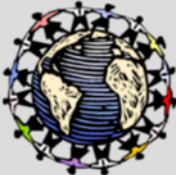
		Reference Bureau's World Population Data Sheet, and the World Bank's World Development Indicators.
<p>Fertility</p> <ul style="list-style-type: none"> The biological component of fertility is the physical ability of a woman to reproduce (fecundity). Over the course of her life, a woman could bear between 13 and 17 children, in the absence of any other factors. The number of children born to a woman varies by social factors that affect when she starts childbearing, the spacing between children, and when she stops childbearing. 	<p>Fertility</p> <ul style="list-style-type: none"> The biological component of fertility is the physical ability of a woman to reproduce (fecundity). Over the course of her life, a woman could bear between 13 and 17 children, in the absence of any other factors. The number of children born to a woman varies by social factors that affect when she starts childbearing, the spacing between children, and when she stops childbearing. 	The biological component of fertility is the physical ability of a woman to become pregnant and carry the pregnancy to a live birth; this is also called fecundity. Over the course of her life, a woman could bear between 13 and 17 children, in the absence of any other factors. The biological ability to bear children is similar across different societies; although, it is also affected by health factors such as nutrition and disease. The number of children a woman will have depends not only on her fecundity but also on social factors that affect when she starts childbearing, the spacing between children, and when she stops childbearing. For example, families in agricultural societies often have more children than families in industrialized areas.
<p>Measures of Fertility</p> <ul style="list-style-type: none"> Crude birth rate (CBR): The number of live births per 1,000 persons in a given year $CBR = \left(\frac{\text{\# births in a year}}{\text{Mid-year population}} \right) \times 1000$	<p>Measures of Fertility</p> <p>Crude birth rate (CBR): The number of live births per 1,000 persons in a given year</p> $CBR = \left(\frac{\text{\# births in a year}}{\text{Mid-year population}} \right) \times 1000$	The crude birth rate is the number of live births per 1,000 population in a given year. This measure tells us how many children will be born in a given population in a given year. It does not tell us who is having children, or how many children the typical woman might have.

<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Age-specific fertility rate (ASFR): The number of births occurring annually per 1,000 women of a specific age (usually given in 5-year age groups) 	<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Age-specific fertility rate (ASFR): The number of births occurring annually per 1,000 women of a specific age (usually given in 5-year age groups) 	<p>ASFR is the number of births occurring annually per 1,000 women of a specified age, usually given in 5-year age groups. ASFR is the number of births occurring annually per 1,000 women of a specific age, usually given in 5-year age groups. It is computed by dividing the number of children born to mothers in a given age group by the total number of women in that age group, multiplied by 1,000. ASFRs are more precise than other measures, but they also require more data; they require births by the age of the mother and the distribution of the population by age and sex.</p>																																
<p>ASFR for Bangladesh, 2004</p> <table border="1" data-bbox="304 695 569 938"> <thead> <tr> <th>Age Group</th> <th>ASFR</th> </tr> </thead> <tbody> <tr> <td>15-19</td> <td>135</td> </tr> <tr> <td>20-24</td> <td>192</td> </tr> <tr> <td>25-29</td> <td>135</td> </tr> <tr> <td>30-34</td> <td>83</td> </tr> <tr> <td>35-39</td> <td>41</td> </tr> <tr> <td>40-44</td> <td>16</td> </tr> <tr> <td>45-49</td> <td>3</td> </tr> </tbody> </table> <p>Source: Bangladesh DHS, 2004</p>	Age Group	ASFR	15-19	135	20-24	192	25-29	135	30-34	83	35-39	41	40-44	16	45-49	3	<p>ASFR for Bangladesh, 2004</p> <table border="1" data-bbox="751 659 989 886"> <thead> <tr> <th>Age Group</th> <th>ASFR</th> </tr> </thead> <tbody> <tr> <td>15-19</td> <td>135</td> </tr> <tr> <td>20-24</td> <td>192</td> </tr> <tr> <td>25-29</td> <td>135</td> </tr> <tr> <td>30-34</td> <td>83</td> </tr> <tr> <td>35-39</td> <td>41</td> </tr> <tr> <td>40-44</td> <td>16</td> </tr> <tr> <td>45-49</td> <td>3</td> </tr> </tbody> </table>	Age Group	ASFR	15-19	135	20-24	192	25-29	135	30-34	83	35-39	41	40-44	16	45-49	3	<p>This example from Bangladesh shows the different fertility rates for the various 5-year age groups. For example, 135 live births occurred per 1,000 women ages 15–19 years old, but 192 births in the next age group, ages 20–24, where more women were married. Notice the definition of childbearing years or reproductive age (15–49). While some women younger than age 15 or older than age 49 do get pregnant and have children, natural fecundity at these very young and older ages is lower than during the age range of 15–49. Therefore, the international convention is to define reproductive ages as 15–49.</p>
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<p>ASFR for Bangladesh, 2004</p>  <p>Source: Bangladesh DHS, 2004</p>	<p>ASFR for Bangladesh, 2004</p>	<p>This graph plots the age-specific fertility rates for Bangladesh. By looking at this graph, can you see what the age-specific fertility rate was among women ages 30–34?</p>																																


<p>ASFR for Bangladesh, 2004</p>	<p>ASFR for Bangladesh, 2004</p> <p>If we look at the x-axis and find the age group 30–34 and draw a straight line up to the curve, we see that there were 83 births for every 1,000 women.</p>
<p>ASFR for Bangladesh 2004</p> <p>Urban vs. Rural</p>	<p>ASFR for Bangladesh, 2004</p> <p>Of course, these age-specific fertility rates will differ throughout the country. What you just saw on the previous slide was the age-specific pattern for the whole country. We usually find that there are large disparities between urban and rural areas. Can you guess which curve represents urban rates and which represents rural rates?</p>
<p>ASFR for Bangladesh, 2004</p> <p>Urban vs. Rural</p>	<p>ASFR for Bangladesh, 2004</p> <p>The yellow line represents the rural population and the orange line represents the urban population. In Bangladesh, as in many countries, fertility rates in rural areas are much higher than in urban areas.</p>


<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Total fertility rate (TFR): The approximate number of births that a woman will have if she moves through her reproductive years having births at the current age-specific birth rates. ▪ TFR is a synthesis measure of the number of births women of different ages are having now. <p style="text-align: right;">23</p>	<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Total fertility rate (TFR): The approximate number of births that a woman will have if she moves through her reproductive years having births at the current age-specific birth rates. ▪ TFR is a synthesis measure of the number of births women of different ages are having now. 	<p>Total fertility rate (TFR): The approximate number of births that a woman will have if she goes through her reproductive years having births at the current age-specific birth rates. The TFR is a synthesis of the number of births women are having today.</p>
<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ TFR is the sum of the age-specific rates (ASFRs) multiplied by 5 and divided by 1000. ▪ TFR is expressed as a rate per woman. ▪ TFR can be compared across populations because it is not influenced by differences in age structure. 	<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ TFR is the sum of the age-specific rates (ASFRs) multiplied by 5 and divided by 1000. ▪ TFR is expressed as a rate per woman. ▪ TFR can be compared across populations because it is not influenced by differences in age structure. 	<p>TFR is calculated as the sum of the ASFRs through all ages, multiplied by 5, and then divided by 1,000. The multiplication by 5 is because a woman will spend 5 years of her life in each 5-year age group. We divide by 1,000 because the original rates were per 1,000, and we want to express the rate per individual woman. The TFR is interpreted as the number of births per individual woman. It can be compared across populations because it is not influenced by differences in age structure.</p>
<p>Calculating TFR from ASFR</p> <div style="border: 1px solid gray; padding: 10px; margin: 10px 0;"> <p>Calculation of TFR from ASFR:</p> $\frac{(135+192+135+83+41+16+3)*5}{1,000} = 3.0$ </div> <p><small>*Note that we multiply total ASFRs by 5 because each age group covers five years.</small></p>	<p>Calculating TFR from ASFR</p> <p>Calculation of TFR from ASFR:</p> $\frac{(135+192+135+83+41+16+3)*5}{1,000} = 3.0$ <p>*Note that we multiply total ASFRs by 5 because each age group covers five years.</p>	<p>Let's use the same example from Bangladesh in 2004 to calculate the TFR. We calculate the TFR by summing all the age-specific fertility rates and multiplying by 5, because each age group covers 5 years, and then divide by 1,000. The TFR in Bangladesh in 2004 was 3.0.</p>

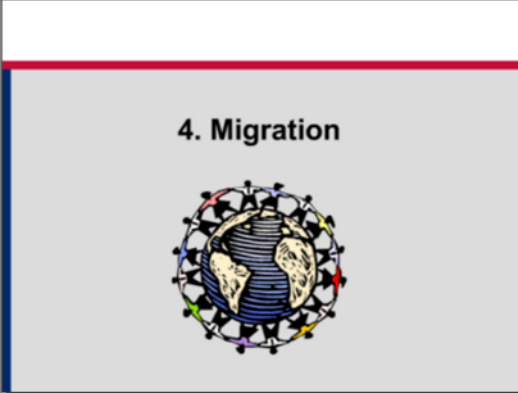
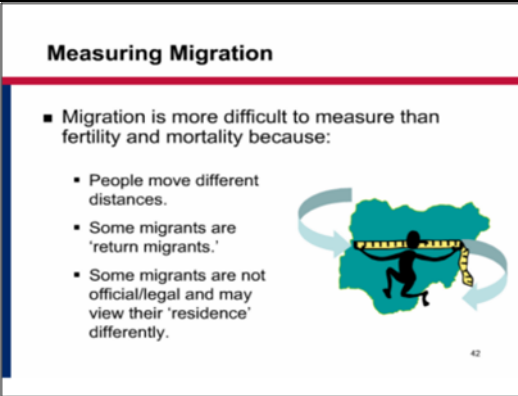
<p>Comparison of TFR among Countries</p> <table border="1"> <thead> <tr> <th>Country</th> <th>TFR</th> </tr> </thead> <tbody> <tr> <td>Nigeria (2003)</td> <td>5.7</td> </tr> <tr> <td>Ghana (2003)</td> <td>4.4</td> </tr> <tr> <td>Bangladesh (2004)</td> <td>3.0</td> </tr> <tr> <td>Colombia (2005)</td> <td>2.4</td> </tr> <tr> <td>USA (2006)</td> <td>2.1</td> </tr> <tr> <td>United Kingdom (2006)</td> <td>1.7</td> </tr> </tbody> </table>	Country	TFR	Nigeria (2003)	5.7	Ghana (2003)	4.4	Bangladesh (2004)	3.0	Colombia (2005)	2.4	USA (2006)	2.1	United Kingdom (2006)	1.7	<p>Comparison of TFR among Countries</p> <table> <thead> <tr> <th>Country</th> <th>TFR</th> </tr> </thead> <tbody> <tr> <td>Nigeria (2003)</td> <td>5.7</td> </tr> <tr> <td>Ghana (2003)</td> <td>4.4</td> </tr> <tr> <td>Bangladesh (2004)</td> <td>3.0</td> </tr> <tr> <td>Colombia (2005)</td> <td>2.4</td> </tr> <tr> <td>USA (2006)</td> <td>2.1</td> </tr> <tr> <td>United Kingdom (2006)</td> <td>1.7</td> </tr> </tbody> </table>	Country	TFR	Nigeria (2003)	5.7	Ghana (2003)	4.4	Bangladesh (2004)	3.0	Colombia (2005)	2.4	USA (2006)	2.1	United Kingdom (2006)	1.7	<p>You will rarely have to calculate the TFR from the ASFRs by hand. The TFR values above show that societal factors influence the rate. The TFRs across these 6 countries are markedly different. Notice that the first three countries, which are largely agrarian, have higher fertility rates.</p>
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<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Replacement level fertility: The TFR at which women have exactly the number of births required to replace themselves and their partners. 	<p>Measures of Fertility</p> <ul style="list-style-type: none"> ▪ Replacement level fertility: The TFR at which women have exactly the number of births required to replace themselves and their partners. 	<p>Another common concept is replacement-level fertility. Replacement-level fertility is the TFR at which women have the number of births required to replace themselves and their partners but no more. If no children died before reaching adulthood, replacement-level fertility would be 2 births per woman (1 to replace the mother and 1 to replace her spouse). If death rates are low, replacement-level fertility averages about 2.12, since not all children will survive to reach reproductive age. If mortality rates are high, replacement-level fertility will be higher.</p>																												
<p>Sex Ratio at Birth</p>  <ul style="list-style-type: none"> ▪ Sex ratio at birth: The number of male births per 100 female births.  <ul style="list-style-type: none"> ▪ In most countries, this value is about 105 for first births. <p>28</p>	<p>Sex ratio at Birth</p> <ul style="list-style-type: none"> ▪ Sex ratio at birth: The number of male births per 100 female births. ▪ In most countries, this value is about 105 for first births. 	<p>Another measure associated with births is the sex ratio at birth. It is measured as the number of male births per every 100 female births. In most countries, this value is 103–105, which means that for every 100 girls born, there are between 103 and 105 boys born. This is also an input in the DemProj Model.</p>																												



<p>Summary of Fertility</p> <ul style="list-style-type: none"> ▪ Fertility has both biological and social components. ▪ Several fertility measures are used in making projections with DemProj: TFR, ASFR, and the sex ratio at birth. ▪ TFR is calculated from ASFR. 	<p>Summary of Fertility</p> <ul style="list-style-type: none"> ▪ Fertility has both biological and social components. ▪ Several fertility measures are used in making projections with DemProj: TFR, ASFR, and the sex ratio at birth. ▪ TFR is calculated from ASFR. 	<p>In summary, fertility has both a biological and social component. There are several fertility measures used in DemProj: TFR, ASFR, and the sex ratio at birth. However, you will see in the next section that ASFR is not an input of the DemProj Model but is instead an output. Age distribution of fertility is actually the input used in the model.</p>
<p>3. Mortality</p> 	<p>3. Mortality</p>	<p>Now that we have a good understanding of fertility measures, we can move to mortality rates. There are several ways to talk about the deaths, or mortality, that occur in the population.</p>
<p>Mortality and Population Growth</p> <ul style="list-style-type: none"> ▪ Declining mortality (and not rising fertility) has been the cause of the accelerating pace of world population growth. 	<p>Mortality and Population Growth</p> <ul style="list-style-type: none"> ▪ Declining mortality (and not rising fertility) has been the cause of the accelerating pace of world population growth. 	<p>It is important to note that declining mortality (and not rising fertility) has been the cause of the accelerating pace of world population growth.</p>

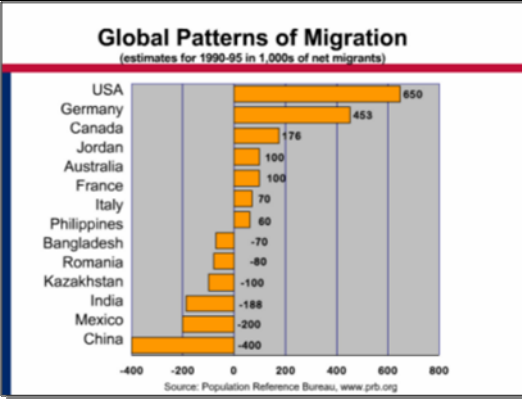
<p>Measures of Mortality</p> <ul style="list-style-type: none"> Crude death rate (CDR): The number of deaths in a given year, per 1000 people in the population in the middle of that year. $CDR = \left(\frac{\text{number of deaths}}{\text{midyear population}} \right) \times 1,000$ <p style="text-align: right;">32</p>	<p>Measures of Mortality</p> <ul style="list-style-type: none"> Crude death rate (CDR): The number of deaths in a given year, per 1000 people in the population in the middle of that year. $CDR = \left(\frac{\text{number of deaths}}{\text{mid-year population}} \right) \times 1,000$	<p>We express the crude death rate (CDR) per 1,000 persons. It is defined as the number of people who die in a given year divided by the number of people in the population in the middle of that year, multiplied by 1,000.</p>																																				
<p>Measures of Mortality</p> <ul style="list-style-type: none"> Infant Mortality Rate (IMR): The number of deaths to children under 1 year of age per 1,000 live births in the same year. $IMR = \frac{\text{number of deaths to children < 1 yr. old}}{\text{number of live births}} \times 1,000$ <p style="text-align: right;">33</p>	<p>Measures of Mortality</p> <ul style="list-style-type: none"> Infant Mortality Rate (IMR): The number of deaths to children under 1 year of age per 1,000 live births in the same year. $IMR = \frac{\text{number of deaths to children < 1 yr. old}}{\text{number of live births}} \times 1,000$	<p>Demographers call children under 1 year of age “infants” and calculate the mortality rate in this age group by dividing the number of deaths in children under 1 year of age by the number of live births in a particular year, multiplied by 1,000.</p>																																				
<p>Comparison of IMR Among Countries, 2005</p> <table border="1" data-bbox="300 1101 611 1349"> <thead> <tr> <th>Country</th> <th>IMR</th> </tr> </thead> <tbody> <tr> <td>Afghanistan</td> <td>163.1</td> </tr> <tr> <td>Nigeria</td> <td>98.8</td> </tr> <tr> <td>Swaziland</td> <td>72.9</td> </tr> <tr> <td>Ghana</td> <td>56.4</td> </tr> <tr> <td>Thailand</td> <td>20.2</td> </tr> <tr> <td>USA</td> <td>6.5</td> </tr> <tr> <td>Canada</td> <td>4.8</td> </tr> <tr> <td>Japan</td> <td>3.3</td> </tr> </tbody> </table> <p style="text-align: center; font-size: small;">Source: World Factbook, 2005.</p>	Country	IMR	Afghanistan	163.1	Nigeria	98.8	Swaziland	72.9	Ghana	56.4	Thailand	20.2	USA	6.5	Canada	4.8	Japan	3.3	<p>Comparison of IMR Among Countries, 2005</p> <table border="1" data-bbox="751 1060 997 1325"> <thead> <tr> <th>Country</th> <th>IMR</th> </tr> </thead> <tbody> <tr> <td>Afghanistan</td> <td>163.1</td> </tr> <tr> <td>Nigeria</td> <td>98.8</td> </tr> <tr> <td>Swaziland</td> <td>72.9</td> </tr> <tr> <td>Ghana</td> <td>56.4</td> </tr> <tr> <td>Thailand</td> <td>20.2</td> </tr> <tr> <td>USA</td> <td>6.5</td> </tr> <tr> <td>Canada</td> <td>4.8</td> </tr> <tr> <td>Japan</td> <td>3.3</td> </tr> </tbody> </table>	Country	IMR	Afghanistan	163.1	Nigeria	98.8	Swaziland	72.9	Ghana	56.4	Thailand	20.2	USA	6.5	Canada	4.8	Japan	3.3	<p>The infant mortality rate (IMR) is considered one of the most sensitive measures of a nation’s health. In less developed countries, the chances of dying are greatest at infancy and remain high during the first few years of childhood. When a country has a high rate of infant death, it usually signals high risks from infectious, parasitic, communicable, and other diseases associated with poor sanitary conditions and malnourishment. As the table shows, as countries develop economically, infant mortality usually declines.</p>
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<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Under five mortality rate (U5MR): The number of deaths to children under the age of five per 1,000 live births in a given year. 	<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Under five mortality rate (U5MR): The number of deaths to children under the age of five per 1,000 live births in a given year. 	<p>DemProj produces a number of mortality rates, and you may already be aware of these. The “under five mortality rate” is the number of deaths to children under 5 years of age per 1,000 live births in the same year.</p>
<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Life expectancy at birth: The average number of years a new cohort of infants can expect to live based on current mortality conditions. 	<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Life expectancy at birth: The average number of years a new cohort of infants can expect to live based on current mortality conditions. 	<p>Life expectancy at birth is the average number of years that a new cohort of infants can expect to live based on current mortality conditions. It is a useful measure that summarizes the implications of current age-specific mortality patterns on lifelong survival.</p>
<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Maternal mortality ratio (MMR): The number of women who die due to pregnancy and childbirth complications per 100,000 live births in a given year. 	<p>Measures of Mortality</p> <ul style="list-style-type: none"> ▪ Maternal mortality ratio (MMR): The number of women who die due to pregnancy and childbirth complications per 100,000 live births in a given year. 	<p>Another measure that we will not cover in DemProj but will be addressed in follow-on models, such as the Safe Motherhood Model, is the maternal mortality ratio (MMR). The MMR is defined as the number of women who die due to pregnancy and childbirth complications per 100,000 live births in a year. You may wonder why this ratio is calculated per 100,000 rather than per 1,000. This is because the ratio rarely exceeds two percent of mothers dying, and it is easier to have more digits in the rate to compare figures across countries.</p>

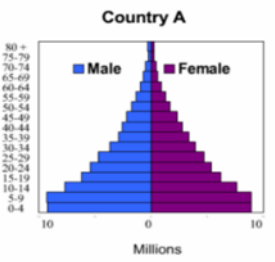
<p>Life Tables</p> <ul style="list-style-type: none"> Life tables tell what would happen to a new birth cohort if the current age-specific death rates were to remain constant over its entire lifetime experience. Life tables give the distribution of deaths that would occur within each age group. Life tables also produce values for life expectancy. 	<p>Life Tables</p> <ul style="list-style-type: none"> Life tables tell what would happen to a new birth cohort if the current age-specific death rates were to remain constant over its entire lifetime experience. Life tables give the distribution of deaths that would occur within each age group. Life tables also produce values for life expectancy. 	<p>A life table shows us what would happen to a new birth cohort if the age-specific death rates for a given period were to remain constant and apply throughout the full life-time experience. Life tables give the distribution of deaths by age group and can also be used to calculate values of life expectancy. In DemProj, life expectancy is an input that links to a life table and a set of mortality ratios (DemProj uses this information in the projection). You will learn more about life tables when we get to the DemProj Model.</p>
<p>Life Tables</p>  <p>The screenshot displays two life tables for Nigeria in 2000. The top table is for males, and the bottom table is for females. Both tables show age-specific mortality rates, survival ratios, and life expectancy values across various age groups.</p>	<p>Life Tables</p>	<p>Because many countries do not have accurate data on mortality by age groups, DemProj uses model life tables based on expected mortality rates at different levels of life expectancy and patterns of mortality in various regions of the world. The life tables shown are for males and females in Nigeria in 2000.</p>
<p>Summary of Mortality</p> <ul style="list-style-type: none"> Declining mortality has been the cause of the accelerating pace of world population growth. IMR is an important indicator of a country's development; increased development is associated with a lower IMR. DemProj uses life expectancy (and its associated age-specific survival ratios) and life tables as inputs for population projections. Life tables show the distribution of deaths by age group and are the source for survival ratios and values of life expectancy. 	<p>Summary of Mortality</p> <ul style="list-style-type: none"> Declining mortality has been the cause of the accelerating pace of world population growth. IMR is an important indicator of a country's development; increased development is associated with a lower IMR. DemProj uses life expectancy (and its associated age-specific survival ratios) and life tables as inputs for population projections. Life tables show the distribution of deaths by age group and are the source for survival ratios and values of life expectancy. 	<p>In summary, declining mortality has been the cause of the accelerating pace of world population growth. The infant mortality rate is an important indicator of a country's development: increased development is associated with a lower IMR. DemProj uses Life Expectancy and model life tables (which are selected based on CDR and IMR) as inputs for population projections. Life tables illustrate the distribution of mortality by age group and are the source for survival ratios and values of life expectancy.</p>


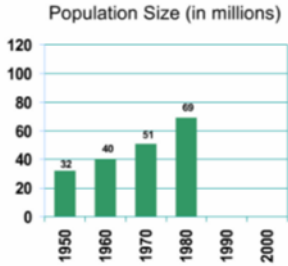
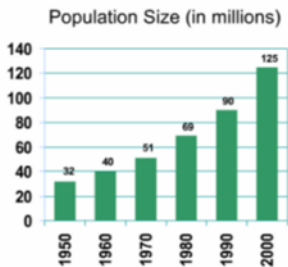
 <p style="text-align: center;">4. Migration</p>	<p>4. Migration</p>	<p>There are other measures of a population that help us understand population projections. The size of a population is not only affected by births and deaths but is also affected by the number of people coming into and out of a place.</p>
 <p>Measuring Migration</p> <ul style="list-style-type: none"> ■ Migration is more difficult to measure than fertility and mortality because: <ul style="list-style-type: none"> ▪ People move different distances. ▪ Some migrants are 'return migrants.' ▪ Some migrants are not official/legal and may view their 'residence' differently. 	<p>Measuring Migration</p> <ul style="list-style-type: none"> ▪ People move different distances. ▪ Some migrants are 'return migrants.' ▪ Some migrants are not official/legal and may view their 'residence' differently. 	<p>Generally, migration is more difficult to measure than fertility and mortality because of some complexities noted here. First, we need to define whether we are trying to measure domestic or international migration. People move within the country all the time. Some migrants are "return migrants." For example, many migrant workers in southern Africa migrate to South Africa to work in the diamond mines on a seasonal basis. Some migrants are not official/legal and may view their "residence" differently. For example, there are many people moving across the border into refugee camps. It's not only difficult to find data on this, but it is also difficult to define permanent residency. Nevertheless, when data are available, migration is measured with rates that are similar to fertility and mortality measures.</p>

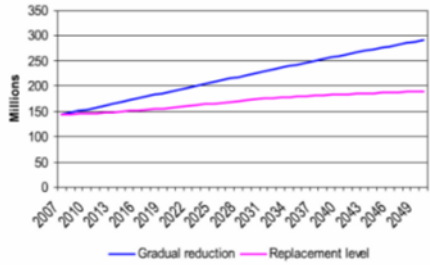
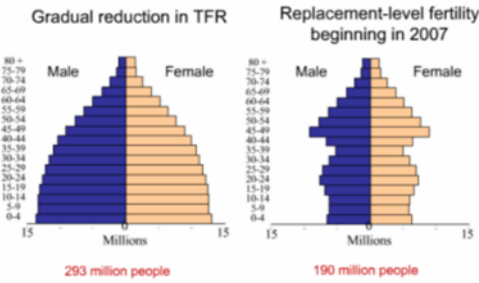
<p>Measures of Migration</p> <ul style="list-style-type: none"> ▪ Net migration: The difference between those who move in and those who move out of an area <p>Net migration =  - </p> <p>People in People out</p>	<p>Measures of Migration</p> <ul style="list-style-type: none"> ▪ Net migration: The difference between those who move in and those who move out of an area 	<p>Net migration is the measure used as an input to a population projection in DemProj. It is the difference between those who move in and those who move out of the area for which the population projection is being prepared. If the projection is for a country, then it is international migration. If the projection area is a region or city, then migration refers to people moving into or out of the region or city.</p>
<p>Measures of Migration</p> <p>Net migration:</p> <ul style="list-style-type: none"> ▪ Negative net migration implies that there are more people moving out than in. ▪ Positive net migration implies that there are more people moving in than out. ▪ Zero net migration does not necessarily mean that nobody is moving in or out of an area. 	<p>Measures of Migration</p> <p>Net migration:</p> <ul style="list-style-type: none"> ▪ Negative net migration implies that there are more people moving out than in. ▪ Positive net migration implies that there are more people moving in than out. ▪ Zero net migration does not necessarily mean that nobody is moving in or out of an area. 	<p>Negative net migration implies that there are more people moving out. Positive net migration implies that there are more people moving in. Note that zero net migration does not necessarily mean that we do not have people moving in and out of an area in a given year. It might mean that equal numbers of people are moving in and out.</p>
<p>Measures of Migration</p> <ul style="list-style-type: none"> ▪ Net international migration is not a major component of population change in most countries. ▪ Age and sex patterns of migration vary considerably. ▪ Net migration can be temporary or can vary throughout the year. 	<p>Measures of Migration</p> <ul style="list-style-type: none"> ▪ Net international migration is not a major component of population change in most countries. ▪ Age and sex patterns of migration vary considerably. ▪ Net migration can be temporary or can vary throughout the year. 	<p>Net international migration is not a major component of population change in most countries. Often, migration can be ignored without a significant effect on the population projection. However, for some countries, and also for cities, migration can be very important. Age and sex patterns of migration vary considerably. In Nairobi, for example, migrants to the city consist largely of young males seeking work. In other cities, migrants to the city are composed primarily of entire families. As noted above, net migration can also be temporary. For example, in Jordan, there was a significant outflow of migrants during the oil boom in the Persian Gulf states in the 1970s and 1980s. However, during the 1990s, there was a net inflow of migrants as families returned to Jordan due to reduced</p>

		employment opportunities in the Gulf.																														
 <p>Global Patterns of Migration (estimates for 1990-95 in 1,000s of net migrants)</p> <table border="1"> <thead> <tr> <th>Country</th> <th>Net Migration (1,000s)</th> </tr> </thead> <tbody> <tr><td>USA</td><td>650</td></tr> <tr><td>Germany</td><td>453</td></tr> <tr><td>Canada</td><td>176</td></tr> <tr><td>Jordan</td><td>100</td></tr> <tr><td>Australia</td><td>100</td></tr> <tr><td>France</td><td>70</td></tr> <tr><td>Italy</td><td>60</td></tr> <tr><td>Philippines</td><td>-70</td></tr> <tr><td>Bangladesh</td><td>-80</td></tr> <tr><td>Romania</td><td>-100</td></tr> <tr><td>Kazakhstan</td><td>-100</td></tr> <tr><td>India</td><td>-188</td></tr> <tr><td>Mexico</td><td>-200</td></tr> <tr><td>China</td><td>-400</td></tr> </tbody> </table> <p>Source: Population Reference Bureau, www.prb.org</p>	Country	Net Migration (1,000s)	USA	650	Germany	453	Canada	176	Jordan	100	Australia	100	France	70	Italy	60	Philippines	-70	Bangladesh	-80	Romania	-100	Kazakhstan	-100	India	-188	Mexico	-200	China	-400	<p>Global Patterns of Migration (estimates for 1990-95 in 1,000s of net migrants)</p>	<p>To give an idea of global migration patterns, the graph provides a summary of patterns of migration between 1990 and 1995 in 1,000s of migrants. China and Mexico have more people migrating out of the country, whereas the United States and Germany have more people migrating in.</p>
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<p style="text-align: center;">5. Population Growth</p> 	<p>5. Population Growth</p>	<p>There are other measures of a population that are necessary to understand population projections.</p>
<p>Population Growth Concepts</p> <ul style="list-style-type: none"> ▪ Net migration: The difference between the numbers moving in and the numbers moving out of a defined area. ▪ Natural Increase: The difference between the numbers of births and deaths in a defined population. 	<p>Population Growth Concepts</p> <ul style="list-style-type: none"> ▪ Net migration: The difference between the numbers moving in and the numbers moving out of a defined area. ▪ Natural Increase: The difference between the numbers of births and deaths in a defined population. 	<p>In the last chapter, we learned that net migration is the difference between the numbers moving in and out of a defined area. Similarly, natural increase is the difference between the numbers of births and deaths in a defined population. Once we make these two calculations, calculating population growth is easy.</p>
<p>Population Growth Rate</p> <ul style="list-style-type: none"> ▪ Population growth is the percentage change in the size of the population in a year. ▪ It is calculated by dividing the number of people added in a year (Natural Increase + Net In-migration), per starting population, times 100. $\text{Population growth rate} = \frac{\text{natural increase} + \text{net in-migration}}{\text{Starting Population}} \times 100$	<p>Population Growth Rate</p> <ul style="list-style-type: none"> ▪ Population growth is the percentage change in the size of the population in a year. ▪ It is calculated by dividing the number of people added in a year (Natural Increase + Net In-migration), per starting population, times 100. $\text{Population growth rate} = \frac{\text{natural increase} + \text{net in-migration}}{\text{starting population}} \times 100$	<p>Population growth rate is the percentage change in the size of the population in a year. It is calculated by dividing the number of people added to a population in a year (Natural Increase + Net In-Migration) by the population size at the start of the year. If births equal deaths and there is zero net migration, the growth rate will be zero. If natural increase is balanced out by net migration, the growth rate will also be zero. In most developing countries, there are still more births than deaths, and there is little net migration, so the growth rate is greater than zero, and the population continues to increase from year to year.</p>




<p>Population Growth Rate</p> <ul style="list-style-type: none"> The population growth rate is difficult to calculate using the previous formula. More conventionally it is calculated using the formula below: $\text{Population growth rate} = \frac{\text{Population (time2)} - \text{Population (time1)}}{\text{Population (t1)}} \times 100$ <p style="text-align: right;">51</p>	<p>Population Growth Rate</p> <ul style="list-style-type: none"> The population growth rate is difficult to calculate using the previous formula. More conventionally it is calculated using the formula below: $\text{Population growth rate} = \frac{\text{Population (time2)} - \text{Population (time 1)}}{\text{starting population (+1)}} \times 100$	<p>The population growth rate is difficult to calculate using the previous formula. More conventionally, it is calculated using this formula.</p>
<p>Population Momentum</p> <ul style="list-style-type: none"> Momentum is the tendency for a population to continue to grow even after replacement-level fertility has been achieved. Population momentum occurs because the age structure has large numbers of women in the childbearing years, so there are many more births than deaths for a long time to come. Therefore, even when replacement-level fertility is achieved, it can take the population growth rate a long time to reach zero! <p style="text-align: right;">52</p>	<p>Population Momentum</p> <ul style="list-style-type: none"> Momentum is the tendency for a population to continue to grow even after replacement-level fertility has been achieved. Population momentum occurs because the age structure has large numbers of women in the childbearing years, so there are many more births than deaths for a long time to come. Therefore, even when replacement-level fertility is achieved, it can take the population growth rate a long time to reach zero! 	<p>Population momentum is the tendency for a population to continue to grow even after replacement-level fertility has been achieved. This occurs because the age structure has large numbers of women in the childbearing years, so there are many more births than deaths for a long time to come. Even though each woman has only two births, there are so many women that there are many births, and the population keeps growing. So it is important to remember that even when replacement-level fertility is achieved, it can still take the population growth rate a long time to reach zero!</p>
<p>Population Momentum</p>  <p>Country A</p> <p>Population momentum is mainly a function of a population's age structure.</p> <p>In other words, the larger the number of children entering their reproductive years, the faster the population will grow.</p> <p style="text-align: right;">54</p>	<p>Population Momentum</p> <p>Population momentum is mainly a function of a population's age structure.</p> <p>In other words, the larger the number of children entering their reproductive years, the faster the population will grow.</p>	<p>Population momentum is mainly a function of a population's age structure. In other words, the larger the number of children entering their reproductive years, the faster the population will grow. For example, in this pyramid of Country A, the momentum is maintained by the children at the base of the pyramid who will be entering their childbearing years.</p>


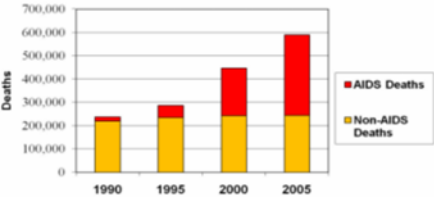
<p>Population Momentum</p> <p>A larger vehicle (train) takes a longer time to stop than a smaller vehicle (bus or car). Similarly, a population heavily concentrated in younger ages will take a longer time to reach zero population growth.</p> 	<p>Population Momentum</p> <p>A larger vehicle (train) takes a longer time to stop than a smaller vehicle (bus or car). Similarly, a population heavily concentrated in younger ages will take a longer time to reach zero population growth.</p>	<p>We can think of a population with a large population momentum like a train. A large train takes longer to stop than a car or even a bus. Similarly, a population heavily concentrated in younger ages will take longer to reach zero population growth. Even if each couple has only two surviving children (replacement level fertility rates), there will be many births, as we saw in the previous slide.</p>														
<p>Country A's Population Growth, 1950-2000</p> <p>Between 1950 and 1980, country A's population doubled.</p>  <table border="1"> <caption>Population Size (in millions)</caption> <thead> <tr> <th>Year</th> <th>Population (millions)</th> </tr> </thead> <tbody> <tr> <td>1950</td> <td>32</td> </tr> <tr> <td>1960</td> <td>40</td> </tr> <tr> <td>1970</td> <td>51</td> </tr> <tr> <td>1980</td> <td>66</td> </tr> <tr> <td>1990</td> <td></td> </tr> <tr> <td>2000</td> <td></td> </tr> </tbody> </table>	Year	Population (millions)	1950	32	1960	40	1970	51	1980	66	1990		2000		<p>Country A's Population Growth, 1950-2000</p> <p>Between 1950 and 1980, country A's population doubled.</p>	<p>Country A's past population growth provides an illustration of population momentum. Over a 50-year period, the population doubled twice. The first time it doubled it took 30 years, from 1950-1980.</p>
Year	Population (millions)															
1950	32															
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<p>Country A's Population Growth, 1950-2000</p> <p>Between 1980 and 2000, Country A's population almost doubled again!</p>  <table border="1"> <caption>Population Size (in millions)</caption> <thead> <tr> <th>Year</th> <th>Population (millions)</th> </tr> </thead> <tbody> <tr> <td>1950</td> <td>32</td> </tr> <tr> <td>1960</td> <td>40</td> </tr> <tr> <td>1970</td> <td>51</td> </tr> <tr> <td>1980</td> <td>66</td> </tr> <tr> <td>1990</td> <td>90</td> </tr> <tr> <td>2000</td> <td>125</td> </tr> </tbody> </table>	Year	Population (millions)	1950	32	1960	40	1970	51	1980	66	1990	90	2000	125	<p>Country A's Population Growth, 1950-2000</p> <p>Between 1980 and 2000, Country A's population almost doubled again!</p>	<p>The second time it doubled it took only 20 years, from 1980-2000. Thus, over 50 years, the population increased, from 32 million to 125 million!</p>
Year	Population (millions)															
1950	32															
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2000	125															

<p>Country A's Population Growth, 1950-2000</p> <ul style="list-style-type: none"> Even if Country A's fertility rate were reduced to replacement level today (i.e., 2.1 births), the population would continue to increase for the next 25 years due to the large number of girls who will enter the reproductive ages over the next several years. 	<p>Country A's Population Growth, 1950–2000</p> <ul style="list-style-type: none"> Even if Country A's fertility rate were reduced to replacement level today (i.e., 2.1 births), the population would continue to increase for the next 25 years due to the large number of girls who will enter the reproductive ages over the next several years. 	<p>Even if Country A's fertility rate were reduced to replacement level today (i.e., 2.1 births), the population would continue to rise for the next 25 years due to the large number of girls who will enter the reproductive ages over the next several years. This information is important for those policymakers who expect to see an immediate impact from family planning programs. Let's look at the impact of two fertility scenarios on population growth.</p>
<p>Country A's Population Growth Under Two Fertility Scenarios, 2007-2050</p> 	<p>Country A's Population Growth Under Two Fertility Scenarios, 2007–2050</p>	<p>This graph shows population growth between 2007 and 2050 for two different fertility scenarios. Under the first scenario, the total fertility rate decreases only gradually from 5.4 to 3.1, between 2007 and 2030 and then between 3.1 to 2.1 between 2030 and 2050. In the second scenario, the total fertility rate decreases instantly to replacement level in 2007. (We know this would never happen because behavior change takes a long time, but we assume this for illustrative purposes.) Even if we achieved replacement-level fertility immediately, the population of Country A would keep growing; it would not begin to stabilize until 2050. This graph shows how population continues to grow even when the fertility rate has leveled off.</p>
<p>Country A's Population in 2050 Under Two Fertility Scenarios</p> 	<p>Country A's Population in 2050 Under Two Fertility Scenarios</p>	<p>This slide shows how the population structure would change by 2050 if replacement-level fertility were achieved today. The age structure of the population would change dramatically. You see on the left the population structure that would occur with just a gradual reduction in the total fertility rate. The pyramid on the right shows how the population structure of Country A would look in 2050 if replacement-level fertility had been achieved in 2007.</p>

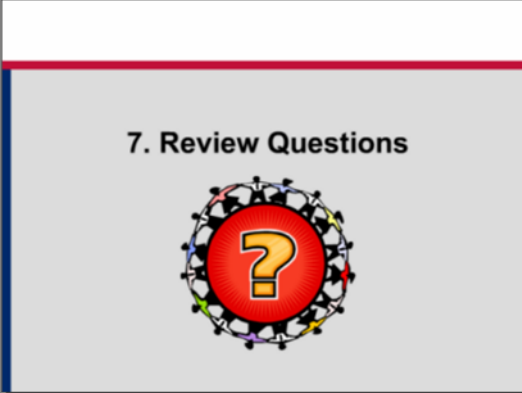


<p style="text-align: center;">2007</p> <p style="text-align: center;">Gradual reduction in TFR Replacement-level fertility beginning in 2007</p>	<p>2007</p>	<p>The following animation will show how the population will change every 5 years as each age group gets older. If you focus on the bottom bar of the population, you can watch it move and advance in the pyramid over time.</p>
<p style="text-align: center;">Components of Growth Method</p> <hr/> <p style="text-align: center;">3 demographic processes influence population change</p> <p style="text-align: center;">Pop(2) = Pop(1) + Births – Deaths + Migrants(in) – Migrants(out)</p>	<p>Components of Growth Method 3 demographic processes influence population change: Birth Deaths Migration</p> <p>$Pop(2) = Pop(1) + Births - Deaths + Migrants(in) - Migrants(out)$</p>	<p>Using the components of growth method, we can estimate the size of the population at some point in the future. We take the population size at the beginning of the time period (Pop1) and add the projected number of births, subtract the projected number of deaths, and add the projected net migration [that is number of migrants in – (minus) number of migrants out] As you can see, the method is simple. However, the limitation of this method is that it does not account for the age/sex structure of a population—a very important factor affecting population growth.</p>
<p style="text-align: center;">Methods of Calculating Population Growth</p> <hr/> <ul style="list-style-type: none"> ▪ Components of growth method ▪ Cohort component method 	<p>Methods of Calculating Population Growth</p> <ul style="list-style-type: none"> ▪ Components of growth method ▪ Cohort component method ▪ 	<p>There are two main methods of estimating future population size: the components of growth method and the cohort component method. I will briefly describe both of these on the following slides.</p>

<p>Cohort component method</p> <ul style="list-style-type: none"> ▪ It begins with an age/sex population distribution for a base year ▪ It uses base year age-specific rates (fertility, mortality, net-migration) <ul style="list-style-type: none"> – Data are usually arranged in 5-year age intervals ▪ It makes assumptions about the future course of each component of population growth 	<p>Cohort component method</p> <ul style="list-style-type: none"> ▪ It begins with an age/sex population distribution for a base year ▪ It uses base year age-specific rates (fertility, mortality, net-migration) <ul style="list-style-type: none"> – Data are usually arranged in 5-year age intervals ▪ It makes assumptions about the future course of each component of population growth 	<p>The cohort component method is more accurate for making projections and is the method used in DemProj. This method begins with an age/sex population distribution for a base year and uses base-year, age-specific rates (fertility, mortality, net-migration), which are usually arranged in 5-year age groups. These rates are then changed in future years according to the assumptions chosen. The assumptions are made about the future course of each of the three components of population growth. For example, age- and sex-specific probabilities of mortality and migration are applied to the members of each age group to calculate how many will exist in each future time period.</p>
<p>Summary of Population Growth</p> <ul style="list-style-type: none"> ▪ Population momentum is the tendency for populations to grow even after replacement-level fertility has been achieved. ▪ Population momentum is mainly a function of a population's age structure. ▪ The cohort component method is a more accurate method for making projections and is the method used in DemProj. 	<p>Summary of Population Growth</p> <ul style="list-style-type: none"> ▪ Population momentum is the tendency for populations to grow even after replacement-level fertility has been achieved. ▪ Population momentum is mainly a function of a population's age structure. ▪ The cohort component method is a more accurate method for making projections and is the method used in DemProj. 	<p>Summary of Population Growth: Population momentum is the tendency for populations to grow even after replacement-level fertility has been achieved. Population momentum is mainly a function of a population's age structure. The cohort component method is a more accurate method for making projections and is the method used in DemProj.</p>
<p>6. The Effects of AIDS on Population Growth</p> 	<p>6. The Effects of AIDS on Population Growth</p>	<p>Until now, we have not discussed the impact of HIV/AIDS on population growth. As you know, in a number of countries, the epidemic has had a significant impact on mortality and even on fertility, although to a lesser extent. AIDS affects both life expectancy and the age and sex pattern of mortality. The epidemic has also had an effect on fertility, as HIV-positive women in their reproductive ages may die early or have fewer children or none at all.</p>

<p>Impact of AIDS on Mortality </p> <hr/> <ul style="list-style-type: none"> ▪ Impact on infant mortality ▪ Impact on life expectancy ▪ Impact on population structure 	<p>Impact of AIDS on Mortality</p> <ul style="list-style-type: none"> ▪ Impact on infant mortality ▪ Impact on life expectancy ▪ Impact on population structure 	<p>In many countries, HIV/AIDS has had a big impact on all measures of mortality, including infant mortality, life expectancy, and mortality in the economically productive ages of 15–49. The greater the HIV prevalence, the larger the impact on mortality. As mentioned in the previous slide, the epidemic also affects fertility, although to a lesser extent. HIV/AIDS also affects the population structure, as people dying from AIDS-related illnesses are mainly in their most productive years. Also, fewer births change the age structure at the bottom of the pyramid.</p>
<p>Impact on Infant Mortality </p> <hr/>  <ul style="list-style-type: none"> ▪ The high prevalence of HIV has increased the IMR significantly in several African countries. 	<p>Impact on Infant Mortality</p> <ul style="list-style-type: none"> ▪ The high prevalence of HIV has increased the IMR significantly in several African countries. 	<p>Infant mortality rates in some African countries are higher than they were in 1990. This is because without prevention of mother-to-child transmission, an HIV+ pregnant woman has a 30% probability of transmitting the HIV virus to her newborn. In Zimbabwe, AIDS causes 70% of the deaths among children less than 5 years of age. When thinking about these rates, it's important to think about the IMR prior to the epidemic. For example, prior to the epidemic, Swaziland made great strides in decreasing its IMR, but the IMR is now high due to AIDS. However, Mozambique has always had a high IMR, so we see a smaller relative impact from the epidemic. As with all the data you see, it's important to think about why numbers may be what they are over time. As public health professionals, we need to think about what is behind the data.</p>

<p>Impact on Life Expectancy</p>  <p>AIDS has set back or erased improvements in life expectancy achieved prior to the epidemic.</p> <p>77</p>	<p>Impact on Life Expectancy AIDS has set back or erased improvements in life expectancy achieved prior to the epidemic.</p>	<p>AIDS also kills young adults, who would otherwise have low mortality. The combination of increased infant mortality and increased mortality among young adults has resulted in severe set-backs and in some countries has erased, many improvements in life expectancy that have been achieved in the last 20 years. The most dramatic effect has been in sub-Saharan Africa.</p>																																						
<p>Impact of AIDS on Life Expectancy</p> <table border="1" data-bbox="247 735 648 873"> <thead> <tr> <th rowspan="2">Country</th> <th colspan="3">Life Expectancy</th> </tr> <tr> <th>1990</th> <th>1995</th> <th>2010</th> </tr> </thead> <tbody> <tr> <td>Zimbabwe</td> <td>56</td> <td>48</td> <td>40</td> </tr> <tr> <td>Zambia</td> <td>50</td> <td>42</td> <td>33</td> </tr> <tr> <td>South Africa</td> <td>63</td> <td>57</td> <td>48</td> </tr> </tbody> </table> <p>Source: US Census Bureau</p>	Country	Life Expectancy			1990	1995	2010	Zimbabwe	56	48	40	Zambia	50	42	33	South Africa	63	57	48	<p>Impact of AIDS on Life Expectancy</p> <table border="1" data-bbox="753 630 1152 862"> <thead> <tr> <th rowspan="2">Country</th> <th colspan="3">Life Expectancy</th> </tr> <tr> <th>1990</th> <th>1995</th> <th>2010</th> </tr> </thead> <tbody> <tr> <td>Zimbabwe</td> <td>56</td> <td>48</td> <td>40</td> </tr> <tr> <td>Zambia</td> <td>50</td> <td>42</td> <td>33</td> </tr> <tr> <td>South Africa</td> <td>63</td> <td>57</td> <td>48</td> </tr> </tbody> </table>	Country	Life Expectancy			1990	1995	2010	Zimbabwe	56	48	40	Zambia	50	42	33	South Africa	63	57	48	<p>Life expectancy at birth in Zimbabwe, Zambia, and South Africa declined between 1990 and 1995 and is expected to decrease further by 2010.</p>
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<p>AIDS Deaths vs. All Deaths among Adults (15-49), Nigeria</p>  <p>80</p>	<p>AIDS Deaths vs. All Deaths among Adults (15-49), Nigeria</p>	<p>With treatments still out of reach for many people, and no cure in sight, HIV infection ultimately results in death. Let's look at a historical representation of Nigeria to illustrate the impact of AIDS on mortality. In the early 1990s, deaths from AIDS began to appear. By 2000, annual AIDS deaths were nearly half of all deaths among the 15–49 population. Clearly, AIDS was killing large numbers of people.</p>																																						

<p>Impact of AIDS on Population Structure</p> <p>In the absence of treatment, AIDS will affect the population distribution by reducing the number of adults in the reproductive years.</p>	<p>Impact of AIDS on Population Structure In the absence of treatment, AIDS will affect the population distribution by reducing the number of adults in the reproductive years.</p>	<p>AIDS also affects the population structure. The dark orange and dark blue represent the age cohorts that are most affected by HIV. The sexual mode of transmission of AIDS implies that it is the adult population that experiences most deaths. That distorts the population pyramid, removing greater numbers of adults in the sexually active ages than from other age groups. AIDS also results in a higher percentage of infant deaths. Also, the surviving infants have fewer adults to take care of them due to adult deaths.</p>																																																																				
<p>Estimated Effect of AIDS on Population Growth</p> <p>Nigeria</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">WITH AIDS EPIDEMIC*</th> <th colspan="2">WITHOUT AIDS EPIDEMIC</th> </tr> <tr> <th>Total Population (millions)</th> <th>Growth Rate</th> <th>Total Population (millions)</th> <th>Growth Rate</th> </tr> </thead> <tbody> <tr> <td>1990</td> <td>89</td> <td></td> <td>89</td> <td></td> </tr> <tr> <td>2000</td> <td>118</td> <td>2.7</td> <td>119</td> <td>2.9</td> </tr> <tr> <td>2005</td> <td>132</td> <td>2.1</td> <td>135</td> <td>2.4</td> </tr> <tr> <td>2010</td> <td>145</td> <td>1.6</td> <td>151</td> <td>2.1</td> </tr> <tr> <td>2015</td> <td>155</td> <td>1.3</td> <td>167</td> <td>1.9</td> </tr> </tbody> </table>		WITH AIDS EPIDEMIC*		WITHOUT AIDS EPIDEMIC		Total Population (millions)	Growth Rate	Total Population (millions)	Growth Rate	1990	89		89		2000	118	2.7	119	2.9	2005	132	2.1	135	2.4	2010	145	1.6	151	2.1	2015	155	1.3	167	1.9	<p>Estimated Effect of AIDS on Population Growth Nigeria</p> <table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">WITH AIDS EPIDEMIC*</th> <th colspan="2">WITHOUT AIDS EPIDEMIC</th> </tr> <tr> <th>Total Population (millions)</th> <th>Growth Rate</th> <th>Total Population (millions)</th> <th>Growth Rate</th> </tr> </thead> <tbody> <tr> <td>1990</td> <td>89</td> <td></td> <td>89</td> <td></td> </tr> <tr> <td>2000</td> <td>118</td> <td>2.7</td> <td>119</td> <td>2.9</td> </tr> <tr> <td>2005</td> <td>132</td> <td>2.1</td> <td>135</td> <td>2.4</td> </tr> <tr> <td>2010</td> <td>145</td> <td>1.6</td> <td>151</td> <td>2.1</td> </tr> <tr> <td>2015</td> <td>155</td> <td>1.3</td> <td>167</td> <td>1.9</td> </tr> </tbody> </table>		WITH AIDS EPIDEMIC*		WITHOUT AIDS EPIDEMIC		Total Population (millions)	Growth Rate	Total Population (millions)	Growth Rate	1990	89		89		2000	118	2.7	119	2.9	2005	132	2.1	135	2.4	2010	145	1.6	151	2.1	2015	155	1.3	167	1.9	<p>Estimated Effect of AIDS on Population Growth. Many Nigerians have AIDS already, and many others with HIV will soon have AIDS, and deaths will occur for many years to come. The red projection reflects the expected deaths, and it shows smaller populations in the future than in the green projection. The growth rates are also less with the red projection.</p>
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 <p>7. Review Questions</p> 	<p>7. Review Questions</p>	<p>We're now going to run through a few review questions to test your knowledge of the material presented in this chapter.</p>
 <p>This completes the lectures for this Part. Thank you for participating!</p>	<p>This completes the lectures for this Part. Thank you for participating!</p>	<p>This completes the lectures for Part 1. Thank you for participating!</p>