The Aging of the Border Population

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I. Introduction:

Environmental issues of the U.S.-Mexico borderlands would attract (and deserve) little attention in the absence of the region's rapid population growth in the last half century. A relatively young population has been a key factor in border region growth (Peach and Williams 2001; Anderson and Gerber 2008). In-migration and natural increase fueled the border population boom. Migration and natural increase are age-related demographic processes. Migrants to the border are more likely to be young than old. Common summary measures of fertility such as the crude birth rate (CBR) or the total fertility rate (TFR) disguise the fact that fertility is an age related phenomenon. Demographic momentum is the name given to the tendency of a disproportionately young population to grow even in the face of low or declining fertility rates.

The border population is aging, a reflection of national trends in both the U.S. and Mexico. Few, if any, significant social, demographic, or economic variables will be left untouched by the aging of the border population. The aging process will force us to re-examine most of what we think we might know about border region development, trans-border interaction, and regional environmental issues. Old assumptions and previously reliable trends in the region will, sooner rather than later, appear unwarranted.

Border population aging will, of course, affect future population growth through diminished in-migration and reduced natural increase. But those changes are only the beginning. The age distribution of a population is a major determinant of the size and growth of the labor force (Bradshaw and Frisbee, 1983). Aging is also an important factor in determining the distribution of income and wealth. Young people simply do not enter the labor force at the high end of the income distribution –nor, for the most part, do young people have substantial savings. The consumption of both durable and non-durable goods is age-dependent. The demand for housing is particularly sensitive to age-related events such as marriage, divorce, children leaving home, or the death of a spouse. The volume and composition of imports and exports is at least partly age-related.

Age is also an important determinant of the for demand public services, particularly education and health care. The so-called social security problem is an aging phenomenon. The capacity of governments at all levels to raise revenue to provide needed public services is also partly a function of the age distribution of the population. In response to changes in the demand for public and private goods and services, changes in the composition of industry are also likely to occur. The environmental consequences of these dramatic changes are not difficult to imagine. The border region will be a very different place and will present even more complex environmental issues in two or three decades.

No one should assume, however, that population aging is the only game in town. Aging is a demographic process that occurs in a broader context. Economic conditions in Mexico and the US will remain important parts of the border equation. Will the US economy experience a long period of slow

(Japanese style) growth? Will Mexico's economy experience a prolonged period of growth and stability? Will there be yet another global financial crisis? The various plausible macroeconomic scenarios in the two nations will also profoundly change the nature of the border region. National policy responses to key issues such as trade, energy, immigration, health care, and education will also play an important role in shaping the future of the border region.

The main purpose of this paper is to examine recent trends of a once youthful, but now aging border population. Section II provides a justification for assertions in the introduction concerning the importance of age in migration, fertility, and labor supply. Section III, (Aging in the U.S. and Mexico), establishes the national context in which border region aging takes place. Section IV (Aging in the Border States) examines aging in the ten border states (California, Arizona, New Mexico, Texas, Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas). Section V (Aging in Border Counties and Municipios) examines aging in the 10 largest county and municipio urban agglomerations along the border. Section VI contains concluding remarks.

II. A Digression on Age-related Phenomena

Claims were made in the introduction that migration, fertility, and labor force participation are age dependent. An explanation of these assertions follows.

Migration to the borderlands, like most migration flows throughout the world, is mainly a migration of young people. Figure 1 displays migration rates to Mexico's six border states from other states in Mexico in 2005. The migration rates were calculated from the micro data samples of Mexico's 2005 CONTEO (INEGI 2010). The micro data files allow computation of tables not generally published. U.S. migration rates shown are five year migration rates. That is, the question asked in the CONTEO was where the individual was five years earlier.

For both men and women, migration rates to the border states increase sharply beginning at very young ages. The peak migration rate is in the 20 to 24 year old age group for both men and women. After age 25, migration rates decline sharply and nearly disappear after age 75. Two thirds (66.1 percent) of the migrants to the border states were under the age of 30.

Migration rates to the U.S. side of the border appear in Figure 2. These rates were compiled from the Public Use Micro Sample data files of the 2008 American Community Survey (ACS) (U.S. Bureau of the Census, 2010). The migration question in the ACS refers to residence one-year earlier –in contrast to the five year period in Mexco's 2005 CONTEO. The migration rates refer to migrants from other states to the four U.S. border states (California, Arizona, New Mexico, and Texas).

While U.S. migration rates to the border states are higher than in Mexico, the pattern with respect to age is remarkably similar. As in Mexico, migrants to the U.S. border states are predominantly young. Also similar to the pattern in Mexico, migration rates rise sharply and reach a peak in the 20 to 24 year old age group for both men and women. After age 25 migration rates fall sharply and, as in Mexico, virtually disappear after age 75. Although not shown here, migration rates to the border counties and municipios have substantially the same pattern with respect to age.

An aging population in migrant sending areas (the non-border states of Mexico and the U.S.) will affect migration flows to the border region and, hence, future border region population growth rates.

Border region population growth has also been fueled by natural increase (the excess of births over deaths). A young population contributes to natural increase even in the face of stable or declining total fertility rates –a phenomenon known as demographic momentum.

Women are more likely to give birth at some ages than at others. Figure 3 displays age specific birth rates In Mexico and the U.S. during the 2000 to 2005 period. In the U.S. and Mexico, birth rates rise quickly from the teen years to the twenties and then begin falling rapidly. Births among women beyond age 45 do occur but are numerically insignificant.

Birth rates in the border states and sub-state areas differ somewhat from the national averages shown in Figure 3, but the general pattern with respect to age is strikingly similar. The key point is that as the population ages, a smaller proportion of border region women will be in the high fertility age groups. As with migration, aging of the border population implies slower future population growth rates.

The other part of natural increase is the death rate. Death rates are also age-specific. Figure 4 shows crude death rates (CDRs) in the United States and Mexico from 1950 to 2050. CDRs declined in Mexico (substantially) and in the U.S. (slightly) between 1950 and 2000. CDRs in both the U.S. and Mexico are projected to increase between the early 2000s and 2050. This increase in CDRs is an age related phenomenon.

Major consequences of border population aging will occur in labor markets (Matheny 2009). Labor force participation rates (LFPRs) exhibit similar patterns with respect to age nearly everywhere. LFPR's for both men and women begin to rise in the teen years, reach a peak in the early twenties, remain at high levels until the fifties, and drop dramatically after about age 55.

The pattern described above is shown in Figure 5 for the U.S. in 2008. Strictly comparable data for Mexico are not available, but Figure 6 shows the proportion of the population 12 years old and older that was economically active in 2000.

III. Aging in the United States and Mexico

Aging is an important feature of the populations of Mexico and the United States. In the border region, aging reflects these national trends.

The median age in both nations has been increasing since the 1970s (Figure 7)[1]. In 1970, the median age in the U.S. was 28.2 years while in Mexico the comparable figure was 16.6 years –somewhat more than half the U.S. figure. According to the United Nations "medium variant" projections, median ages in Mexico and the U.S. will continue to increase through 2050 –the last year of the projections. As shown in Figure 7, median age in the U.S. and Mexico are converging rapidly. By 2040, the median ages are approximately equal (U.S. = 40.8 years and Mexico = 40.3 years). By 2050, Mexico's projected median age (43.9) is higher than the projected U.S. median age (41.7).

[1] Unless otherwise noted, the data in this section are from Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision*, http://esa.un.org/unpp. January 13, 2010. Figures constructed by the author. The data are from the UN "Medium Variant" projections.

Increases in life expectancy at birth (Figure 8) and generally decreasing total fertility rates (Figure 9) contribute substantially to the increasing median ages in the two nations. The increase in life expectancy in Mexico has been particularly dramatic. Mexico's 1950 life expectancy of 50.7 years increased to 76.1 years by 2000. U.S. life expectancy increased from 68.9 years to 78.3 years from 1950 to 2000. Most of the gains in life-expectancy in the two nations have probably already occurred. The UN projections indicate only modest increases in life expectancy (figure 9) through 2050 with life expectancy in both nations in the low 80s.

A substantial downward trend in fertility in Mexico has been apparent since the mid-1970s. A little history is important to understand this phenomenon. In the 1930s, Mexico deliberately pursued a pro-natalist, high population growth strategy. The logic behind this strategy was two-fold. First, Mexican policy-makers thought that a highly populated Mexico (particularly its northern border states) would be less attractive to annexation by the U.S. Second, it was assumed that Mexican economic growth had been inhibited by a small labor force and small domestic market. The policy worked and from the 1930s to the early 1970s Mexico's fertility and population growth rates were high. In 1973, Mexico adopted a series of policy measures designed to reduce population growth. The policy changes worked and Mexico's total fertility rate began to drop noticeably by the mid-1970s.

In the U.S., the baby-boom generation (born 1946-1964) changed the age distribution dramatically beginning in the late 1940s. The U.S. baby-boom generation continues to affect the age distribution. A baby-boom echo was clearly observable in the 1990s. Over the next decade, the millions of the first born baby-boomers will retire and create unprecedented changes in public and private retirement systems.

Figures 10 through 19 are population pyramids for Mexico and the United States beginning in 1950 and continuing through 2050 at 25 year intervals. The changes in the age structure of the two populations described above are not difficult to discern in the pyramids. In 1950 (Figure 10) Mexico's age distribution exhibited the classic pyramid shape that these figures are named after. In 1950, 52.7 percent of Mexico's population was under 20 years old. In contrast, 34.1 percent of the U.S. population was less than 20 years old in 1950, despite the start of the baby-boom (Figure 11).

In 1975, Mexico (Figure 12) Mexico's age distribution was still the classic pyramid shape and 47.6 percent of the population was till under the age of 20. In the U.S. in 1975 (Figure 13), the end of the baby-boom is apparent and only 23.3 percent of the population was under the age of 20.

By 2000 the aging of both populations is obvious. Mexico's 2000 pyramid (Figure14) is beginning to lose its classic pyramid shape. In the U.S. in 2000 (Figure 15) shows the baby-boom echo and the aging of the population.

By 2025, the aging of both populations is a dominant feature. In Mexico (Figure 16), the classic pyramid shape of the age distribution is nearly gone and only 28.7 percent of the population is below age 20. In the U.S. (Figure 17), large numbers of baby-boomers are now above age 65.

By 2050, more than a quarter of the populations of both nations (28.2 percent in Mexico and 27.4 percent in the U.S.) are 60 years old or older (Figures 18 and 19). Even a glance at the pyramids over time reveals dramatic changes in the two age distributions.

IV. Aging in the Border States

Historically, the U.S. border states (Table 1) have had a younger population than the nation as a whole. In 1950, three of four border states had a median age less than the national average and by 1960 all four border states had median ages less than the national average. Consistent with national trends, border state median ages began to rise in the 1970s. Figure 20 illustrates the importance of the national trend for the four border states. While median ages differ in the border states, the trend in each state is remarkably consistent with the national trend. By 2000, all four border states had median ages in the low 30s although none exceeded the national average. Census Bureau projections suggest that median age in Arizona and New Mexico will exceed the national median by 2020 and this could occur when the 2010 Census is completed.

Table 1
Median Ages in the Border States

	1960	1970	1980	1990	2000	2010	2020	2030
California	29.1	28.1	29.9	31.5	33.3	34.9	35.7	37.4
Arizona	25.7	26.3	29.2	32.2	34.2	36.4	38.2	39.3
New Mexico	22.9	23.9	27.4	31.3	34.6	38.3	41.2	44.8
Texas	27.0	26.4	28.0	30.8	32.3	33.4	34.3	34.6
Border States	28.5	27.3	30.2	31.3	33.1	34.6	35.6	36.3
United States	29.5	28.1	30.0	32.9	35.3	36.6	37.9	39.5

Sources: 1950 to 2000: U.S. Bureau of the Census, Census of Population and Housing (1950, 1960, 1970, 1980, 1990, and 2000, state volumes. http://www.census.gov/prod/www/abs/decennial/index.htm
2010 to 2030, U.S. Bureau of the Census, State Population Projections, Issued 2005.
http://www.census.gov/population/www/projections/statepyramid.html

Figures 21 through 28 are population pyramids for the combined U.S. border states. Pyramids are shown at ten year intervals from 1960 to 2030[2]. The figures illustrate graphically the aging of the border state populations. Also illustrated is the fact that demographic events last a long time. For example, the baby boom is obvious in the 1960 pyramids. Further, the baby-boom and its echo are clearly visible in the 1990 pyramid. In fact, the aging of the baby-boom generation can be seen in the border state pyramids through 2030.

Median ages for Mexico's six border states are displayed in Table 2. In 1960, five of Mexico's six border states had a median age higher than the national average, and by 1980 none of Mexico's border states had a lower median age than did Mexico as a whole. The differences between the border states and the nation are, however, small. Median ages in the six Mexican border states have averaged about 1 year above the national figure (Table 2). Mexico's border states, like the U.S. border states, are aging rapidly. By 2000 Mexico's border states had a median age of 24.1 years –nearly seven years higher than in 1960. By 2020, all of Mexico's border states are projected by CONAPO to have a median age above 30

[2] Pyramids for each of the four U.S .border states and Mexico's six border states are available on request.

and the median age for the border states reaches 35.0 years by 2030 –a figure more than double the border states median age in 1980 (17.4), but less than the projected national median of 36.2 years.

Table 2:
Median Ages in Mexico's Border States: 1960 to 2030

	1960	1970	1980	1990	2000	2010	2020	2030
Baja California	17	16.4	18.8	21.2	23.5	27.2	30.2	33.3
Sonora	17.5	16.8	18.4	20.9	23.9	27.4	31.6	35.8
Chihuahua	17.7	16.6	18.3	20.9	23.6	27.3	31.5	35.8
Coahuila	17.9	16.9	18.0	20.5	23.7	26.9	30.9	35.0
Nuevo Leon	19.4	17.5	18.5	21.5	24.9	28.3	32.1	35.6
Tamaulipas	18.2	17.1	18.5	21.2	24.2	27.7	31.8	35.8
Border States	18.1	16.9	18.4	21.1	24.1	27.6	31.3	35.0
Mexico	17.1	16.6	17.4	19.8	23.4	27.6	31.9	36.2

Sources: Medians computed by the author from 5 year age and sex data. 1960 to 2000 data are from INEGI, Censo de Poblacion y Vivienda, 1960, 1970, 1980, 1990, and 2000. 2010 to 2030 data are from CONAPO (2008) Proyecciones de Poblacion. Mexico from United Nations (2008).

Figures 29 through 36 are population pyramids for the combined Mexican border states. Pyramids are shown at ten year intervals from 1960 through 2030 –the same sequence shown for the U.S. Border states in Figures 21 through 28. These figures use the same horizontal axis scale so that both the shape of the age distribution and the growth of the border state's population can be seen over time. In 1960, (Figure 29) the border states age distribution exhibited the classic pyramid shape (as did Mexico as a whole, see Figures 10 and 11). In 1970 (Figure 30), the border states age distribution retained its pyramid like shape, though the growth of the population is apparent.

By 1980 (Figure 31), the decrease in fertility that began to occur in the 1970s is visible in the 0 to 4 year old age cohort. This decrease in fertility is also apparent in the 1990 pyramid shown in Figure 31. By 2000 (Figure 32), the first two age-sex cohorts (0 to 4 and 5 to 9 year olds) are again relatively large. This increase in the first two age cohorts is an echo effect from having large numbers of women in the high fertility years and not an increase in age-specific fertility rates. By 2010 (Figure 33), the youngest age cohort (0 to 4 years old) is again smaller than the next age cohort (5 to 9 year olds). By 2020 (Figure 35) and 2030 (Figure 36), the aging of the border states' population is obvious.

In 1980, 53.8 percent of the border states' population was under 20 years old. By 2030, only 27.1 percent of the border state population is projected to be under the age of 20. During the same time frame, the percent of the border population 65 years old and older will increase from 3.7 percent to 10.7 percent. Figure 37 illustrates the dramatic increase in the percent of the border-state population 65 years old and older. By 2030, the CONAPO projections indicate that there will be more than 2.5 million people 65 years old and older in the six border states.

V. Aging in the Border Counties and Municipios

As with the two nations and the ten border states, the population directly adjacent to the border is also aging. Table 3 (U.S.) and Table 4 (Mexico) display median ages in the ten largest border counties and municipios from 1970 to 2005. The ten largest border counties accounted for 95.6 percent of the total border county population and the ten largest muncipios accounted for 88.6 percent of the total border municipio population in 2005.

Table 3

Median Ages in the ten Largest Border Counties

			Median Age				
Rank	County	2005 Population	1970	1980	1990	2000	2005
1	San Diego County	2,931,689	25.4	28.8	30.9	33.2	33.4
2	Pima County	947,533	27.2	29.5	32.8	35.7	36.0
3	El Paso County	709,992	22.7	25.0	27.9	30.0	30.6
4	Hidalgo County	667,154	21.2	24.2	26.1	27.2	27.2
5	Cameron County	371,492	22.2	25.0	27.4	29.0	29.1
6	Webb County	221,165	21.9	23.6	25.5	26.5	26.5
7	Dona Ana County	189,330	22.0	24.8	27.9	30.2	30.4
8	Yuma County	180,009	24.7	27.9	31.2	33.8	34.1
9	Imperial County	153,285	24.0	26.4	28.8	31.0	31.4
10	Cochise County	125,498	24.3	26.8	32.6	36.8	37.8
	Ten Largest	6,497,147	24.6	27.7	30.1	32.0	32.2

Listed by population rank in 2005.

Table 4

Median Ages in the ten Largest Border Municipios

			Median Age				
Rank	Municipio	2005 Population	1970	1980	1990	2000	2005
1	Tijuana	1,410,687	16.7	18.8	21.1	23.3	24.7
2	Juarez	1,313,338	16.8	18.9	21.3	23.4	24.6
3	Mexicali	855,962	16.1	18.7	21.4	24.4	25.9
4	Reynosa	526,888	16.7	18.4	21.3	23.5	24.6
5	Matamoros	462,157	17.1	18.8	21.2	23.4	24.9
6	Nuevo Laredo	355,827	17.3	18.6	21.4	22.6	24.7
7	Nogales	193,517	17.4	19.1	21.0	22.9	24.0
8	San Luis Rio Colorado	157,076	15.7	17.5	20.5	23.3	24.9
9	Piedras Negras	143,915	17.7	19.0	21.3	23.2	24.4
10	Acuna	126,238	17.0	17.8	20.1	22.1	23.3
	Ten Largest Municipios	5,545,605	16.7	18.7	21.2	23.1	24.8

Listed by population rank in 2005.

In 1970, the ten largest border counties (U.S.) had a median age of 24.6, lower than either the border states median age (27.3 years) or the nation's median age (28.1 years). The 1970 border county median ages ranged from 21.2 years in Hidalgo County, Texas to 27.2 years in Pima County, Arizona. By 2000, the ten largest border counties median age had increased to 32.2 years –still somewhat below median ages in the border states (33.1 years) and the U.S. (35.3 years). In 2000, seven of the ten largest border counties had a median age of 30.0 or greater.

On the Mexican side of the border, the ten largest muncipios had a median age of 16.7 years in 1970. While the 1970 median age in the ten largest muncipios differed little from the corresponding figure in the border states (16.9 years) and Mexico as a whole(16.6 years), this median was considerably smaller than in the U.S. border counties (24.6). By 2000, the median age in the ten largest border municipios reached 23.1 years –a figure that remains lower than the ten largest U.S. border counties (32.2 years) but very similar to Mexico's median age of 23.4 years.

The aging of the border county and municipio populations is also apparent in population pyramids shown in Figures 38 through 41. Figures 38 and 39 illustrate the age distributions of the ten largest U.S. border counties in 1970 and 2005. Figures 40 and 41 illustrate the age distributions of the ten largest border municipios in 1970 and 2005. The pyramids also suggest that the aging process will continue in the border counties and municipios. If past patterns are a reasonable guide to the future, the median age in the U.S. border counties will reach 35 or 36 years by 2030, while the border municipios may reach a slightly higher median age –perhaps 36 or 37 by 2030.

VI. Concluding Remarks

In the absence of a major catastrophe (war, epidemic, or the like) or a major and unlikely demographic change, the aging of the border population is a foregone conclusion. The aging process will continue in Mexico and the United States, the border states, and the border counties and municipios. An aging border population is built into its current age-structure and is reinforced by declining fertility rates, increasing life-expectancy, and the likelihood of lower migration rates due to changes in the age structure of migrant sending regions.

Aging of the border population is occurring now and will continue for decades to come. Some of the consequences of border region population aging were described briefly in the introduction. These included the effects of aging on the labor force, the composition of industry, and the demand for goods and services, both public and private. Consider, for example, how different the development of the *maquiladora* industry might have been if the median age of the border municipios in the 1970s and 1980s (then 17 or 18 years) had been twice as high.

These and other age-related effects will also change the way we think about trans-border interaction, the growth of the border region, and borderland environmental problems. Policy-makers can do little to alter the nearly inevitable aging of the border population but they can do a great deal to prepare for its consequences.

First, there is an obvious need for more and better data relating age to economic and environmental issues. Water consumption (and availability), for example, is a critical borderlands issue. Water consumption is almost certainly age-related. Families with children are likely to need larger houses and consume more water than older –perhaps retired—people. Age-related changes in the demand for

goods and services will also change industrial water use. There is almost no data in either the US or Mexico concerning water consumption by age. Energy consumption, both primary and secondary, is also likely to be age-dependent. Again, the need for more and better data in an aging world becomes obvious.

Second, no one needs to be told that economic activity and problems of the environment are strongly linked. An aging population adds to the complexity of these linkages and their policy implications. The recent economic crisis, for example, had different effects on various demographic groups (Engemann and Wall, 2010). With or without sophisticated modeling efforts (see next paragraph), policy analysts need to be acutely aware of age-specific impacts of major economic events and economic policy actions.

Third, aging increases the need for increasingly complex and sophisticated economic and environmental modeling of trans-border interaction. The border counties and municipios are not homogeneous. These areas have different age distributions now and differences will remain even though aging will be a common phenomenon throughout the region. The B20 systems dynamics models have well-developed demographic components –including single year of age and sex cohort-component projection methods. Age and sex distributions within the models are directly linked to the labor force and economic activity and indirectly linked to environmental sectors. The B20 models need to be updated and others need to be built.

Fourth, aging both nationally and in the borderlands will change the political environment that conditions all environmental policy-making. Age is an important determinant of voting behavior –even in the borderlands (Peach and Adkisson, 1999).

In short, the aging process occurring nationally and in the borderlands will force all of us to re-assess this incredibly dynamic region. This re-assessment could lead to imaginative and effective environmental policy and strategy for the borderlands.

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Figure 1

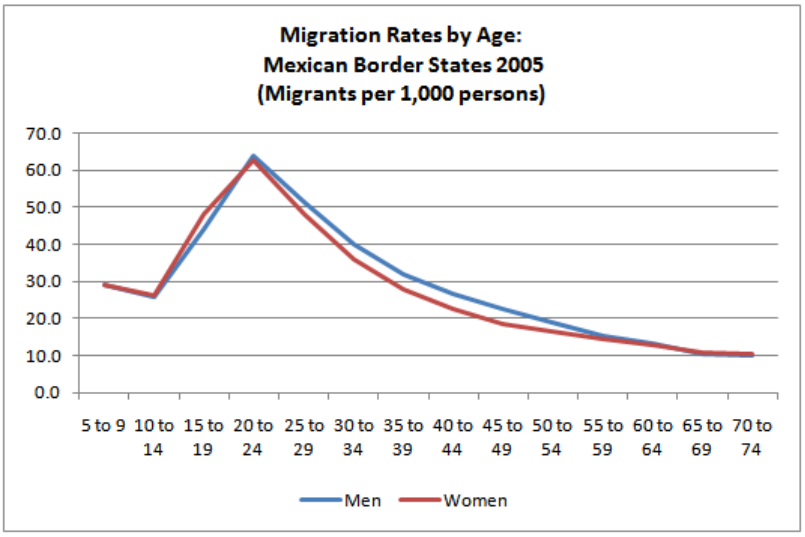


Figure 2

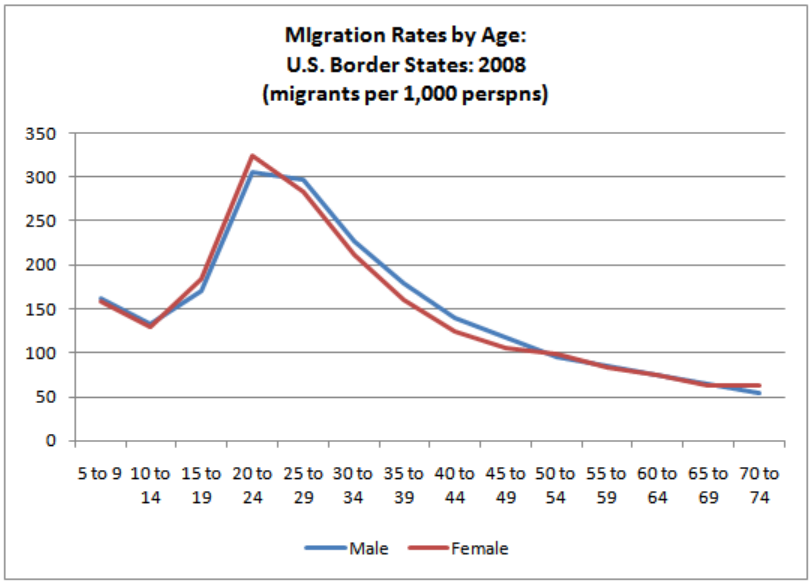


Figure 3

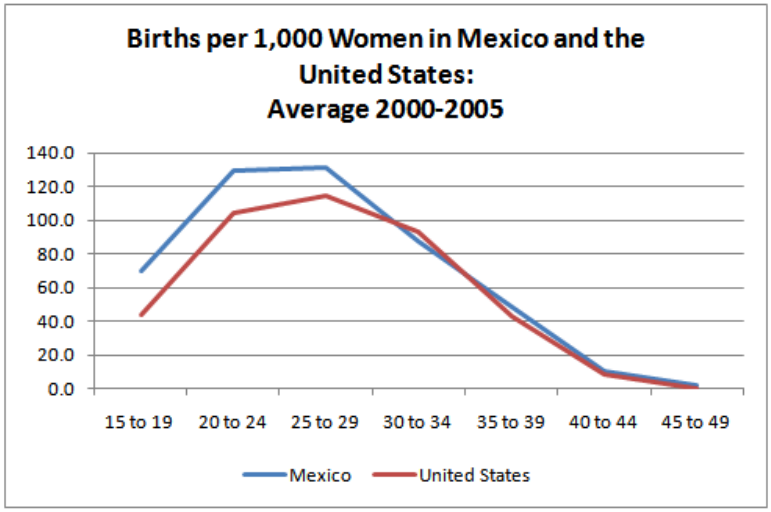


Figure 4

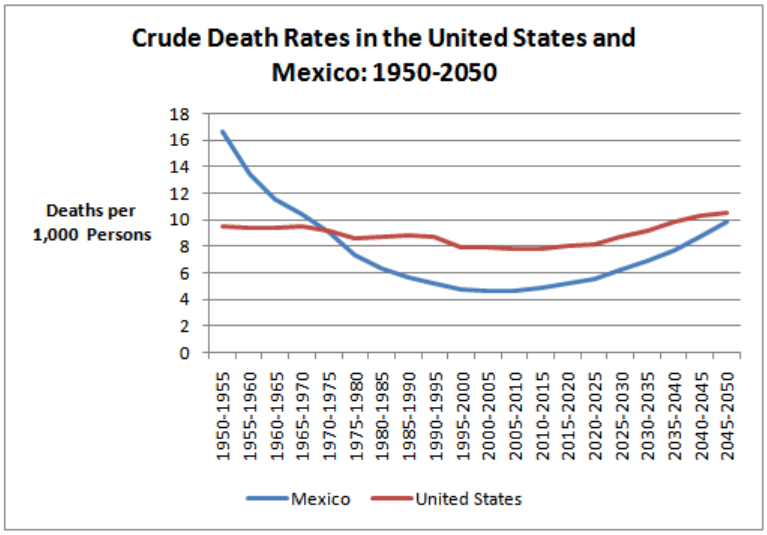


Figure 5

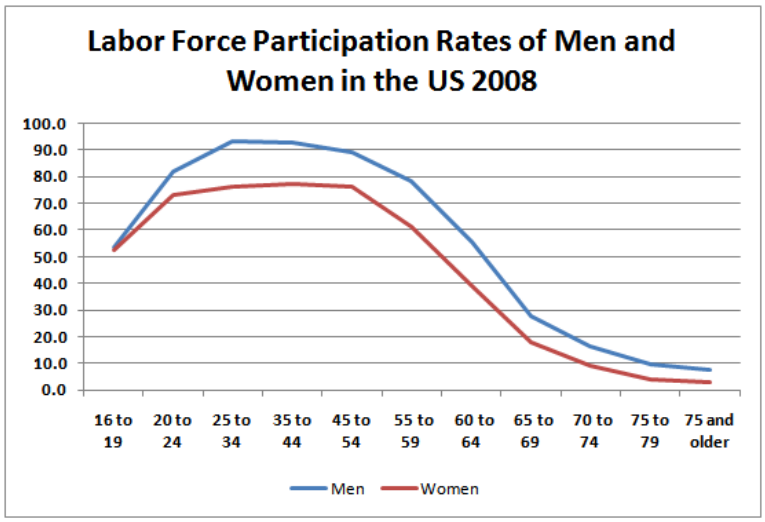


Figure 6

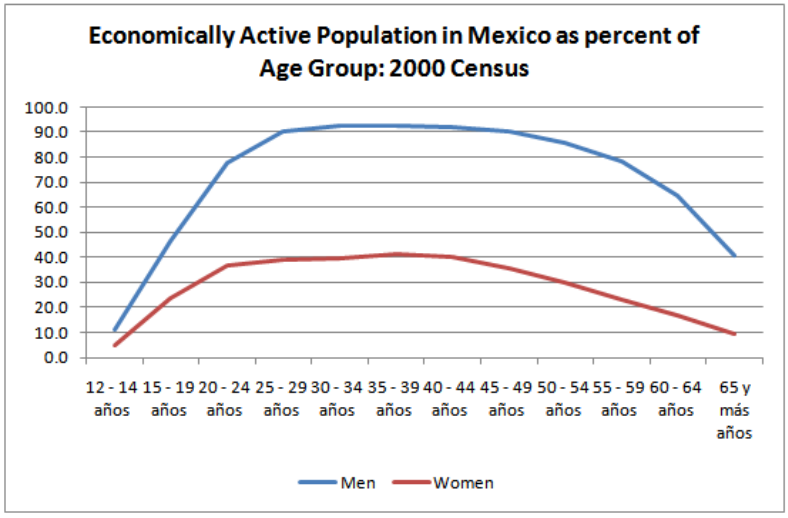
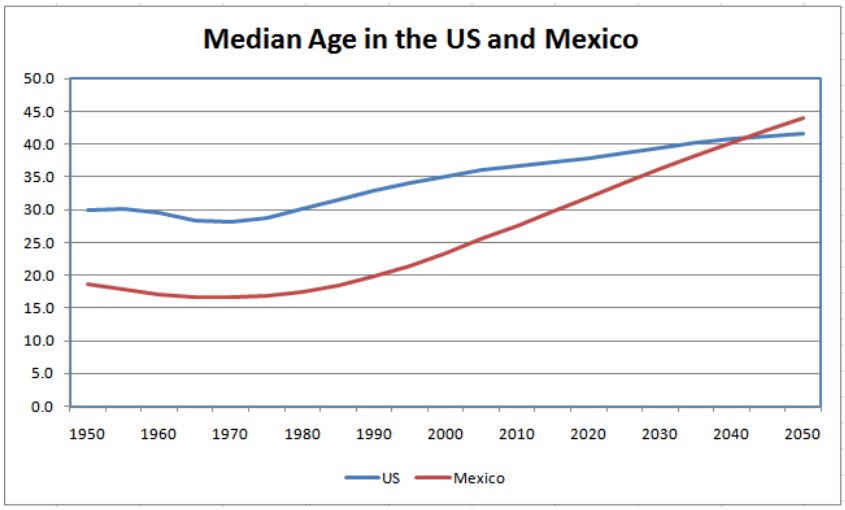


Figure 7



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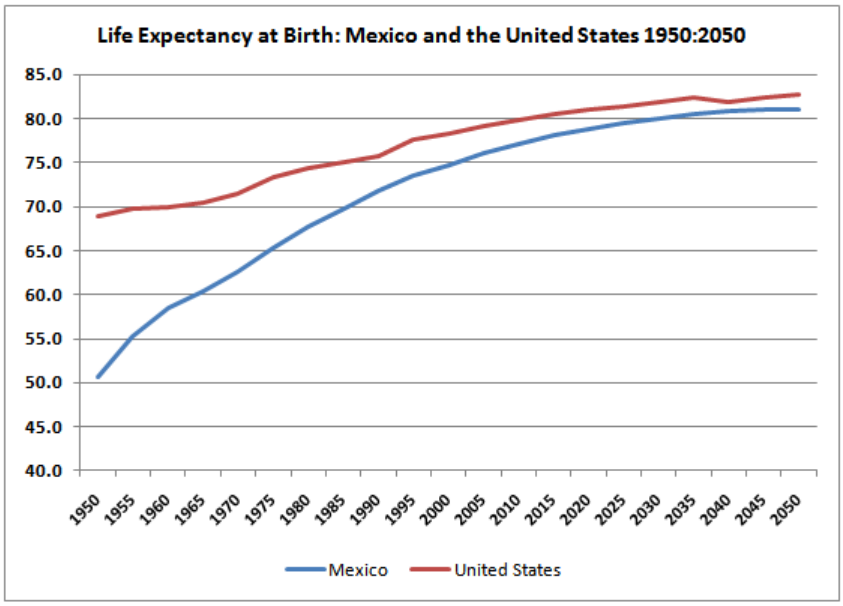

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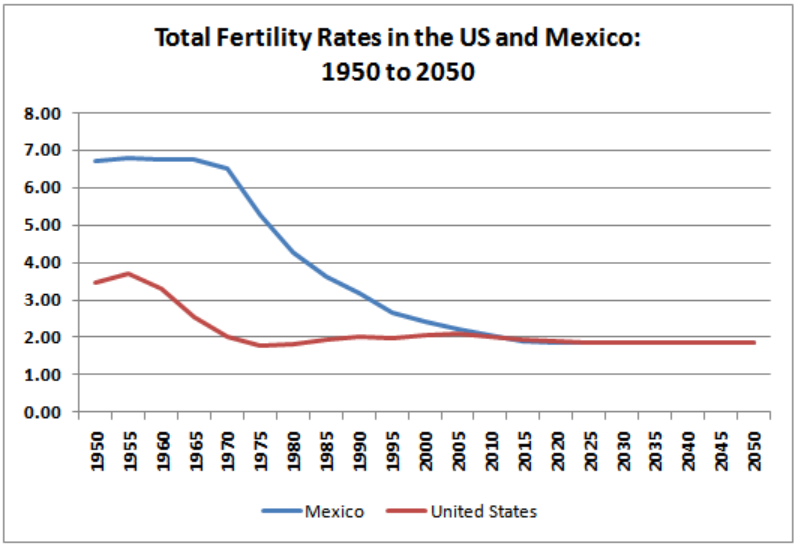
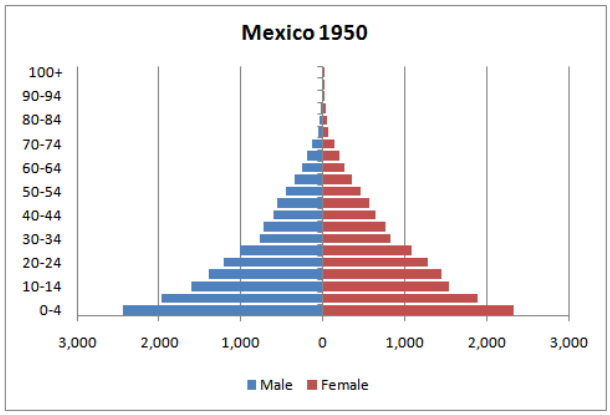
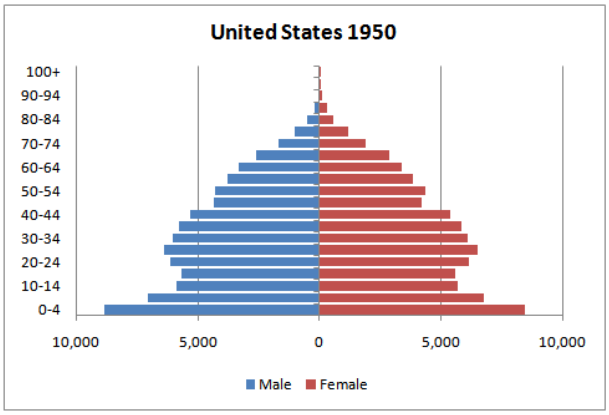
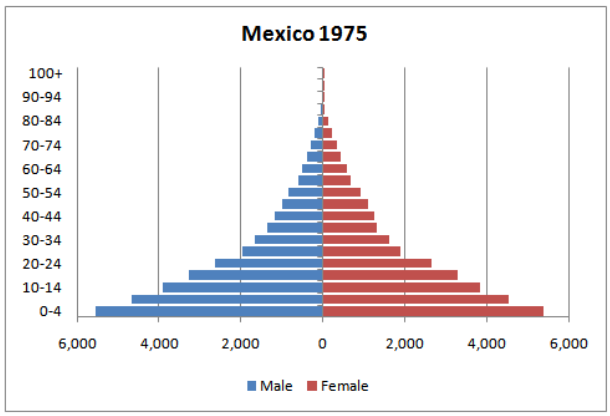
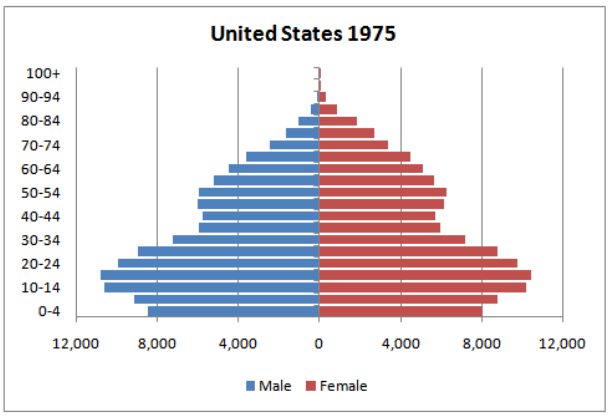


Figures 10, 11, 12, and 13

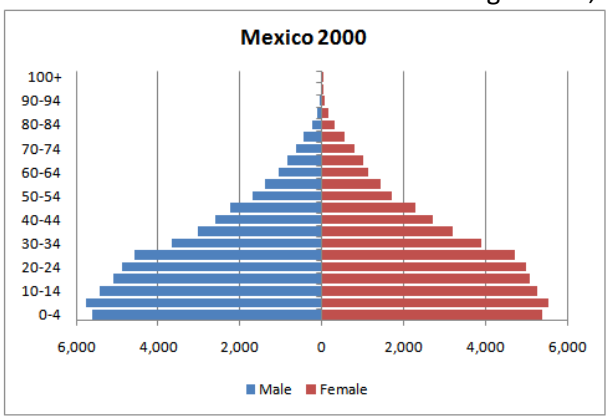


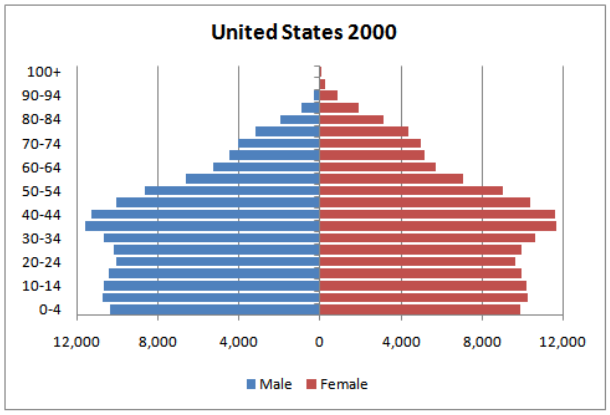


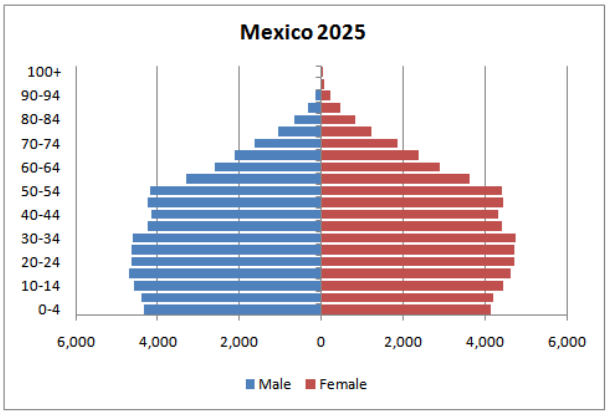


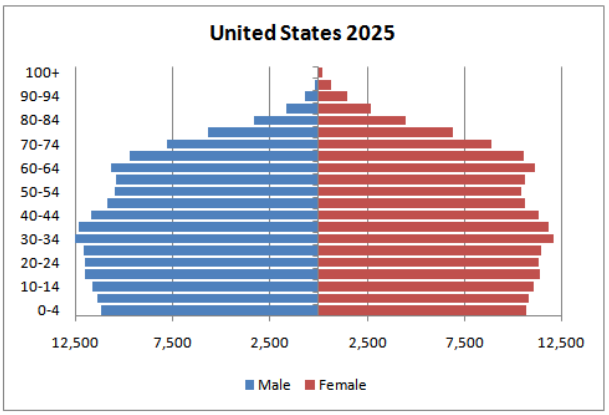


Figures 14, 15, 16, and 17

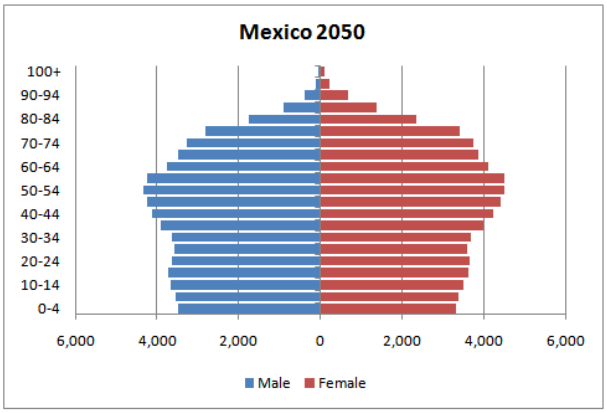


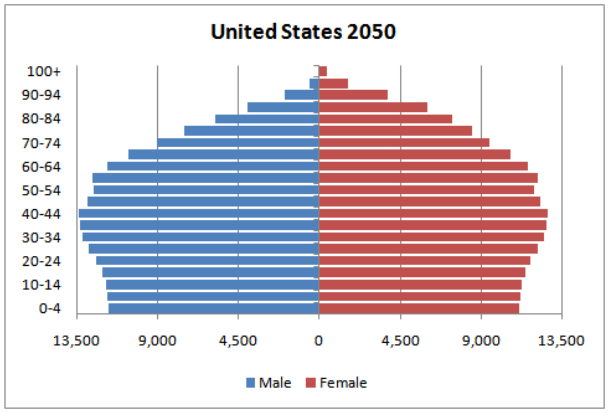






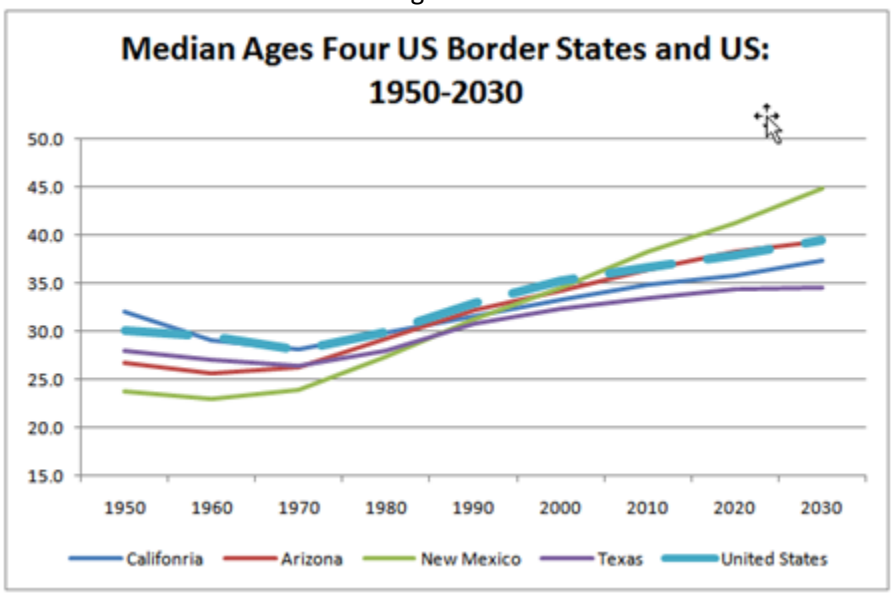
Figures 18 and 19



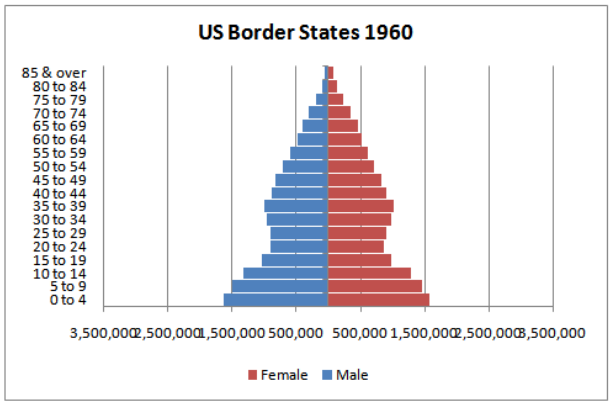


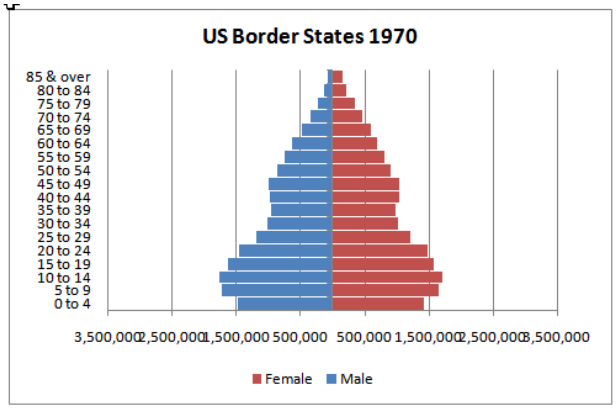
Source (Figures 10 through 19): Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision*, http://esa.un.org/unpp. January 13, 2010. Figures constructed by the author. The data are from the UN "Medium Variant" projections.

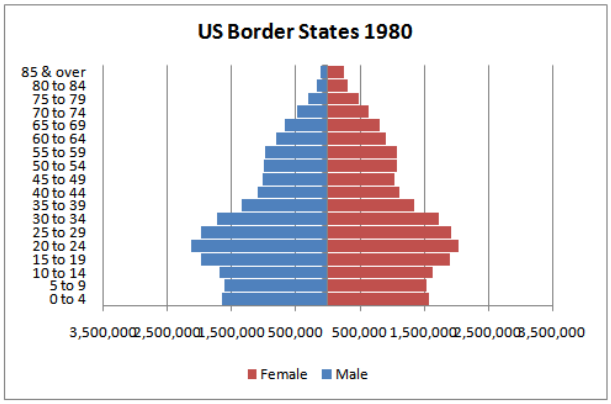
Figure 20

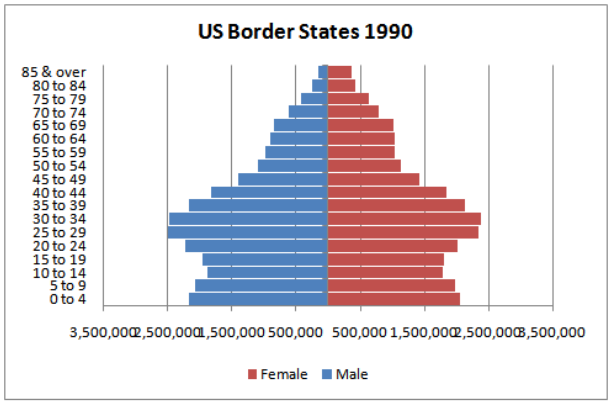


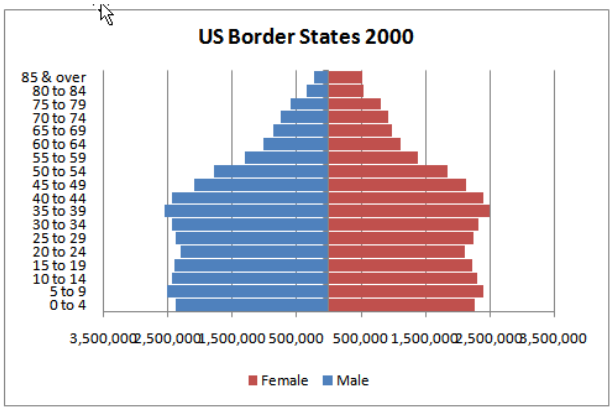
Figures 21 through 28

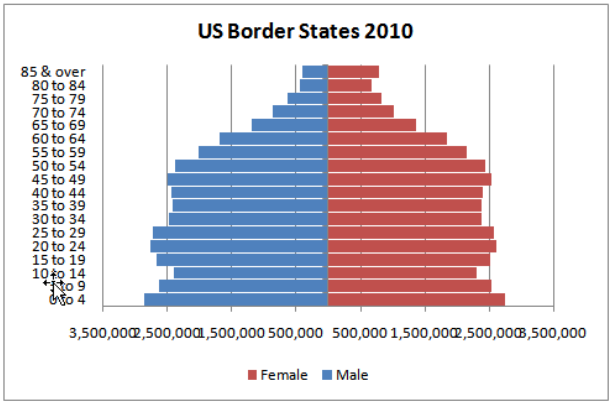


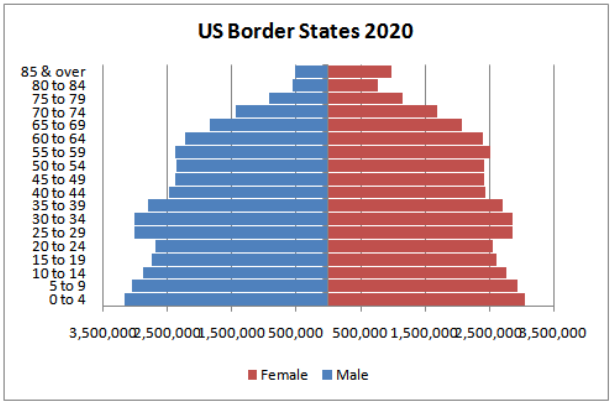


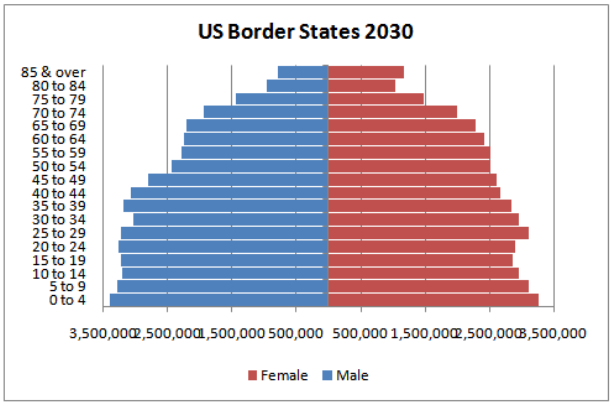




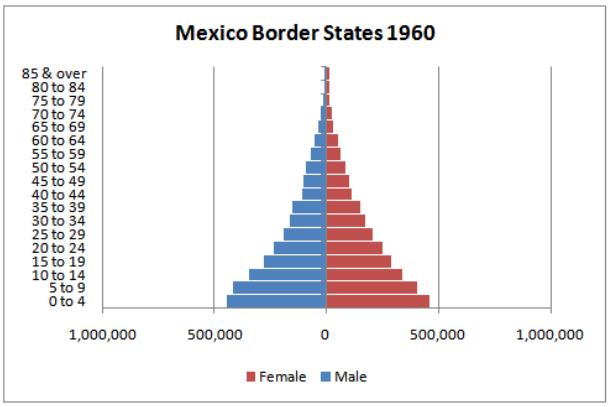


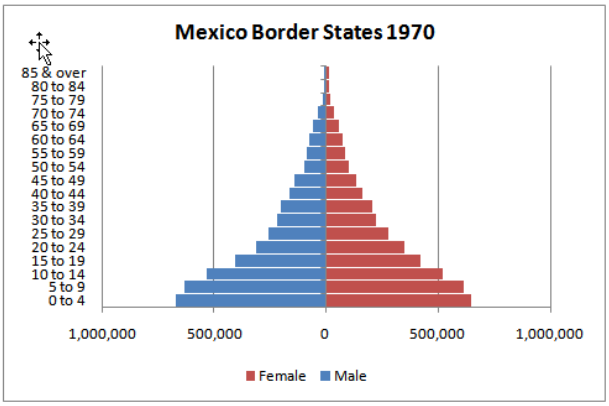


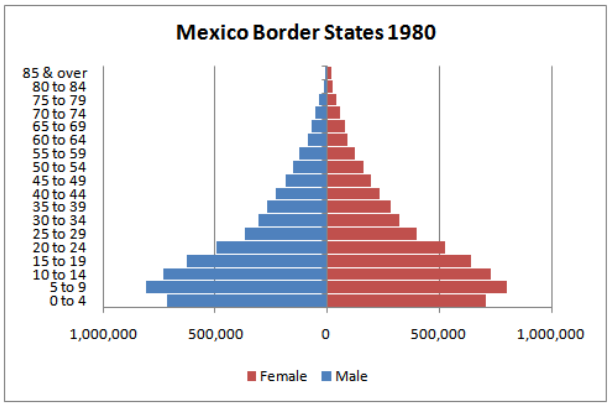


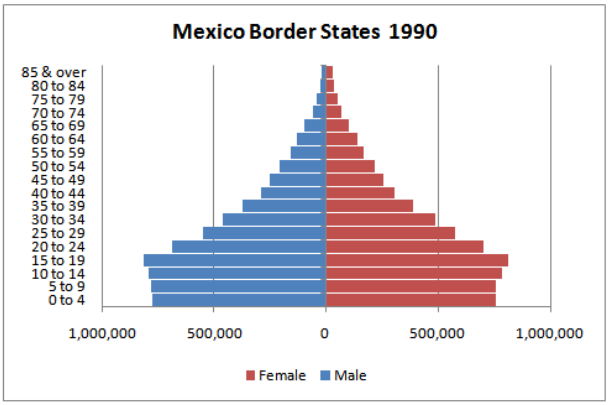


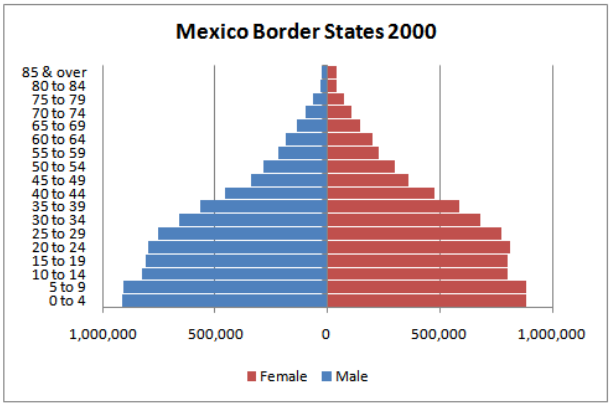
Figures 29 through 36

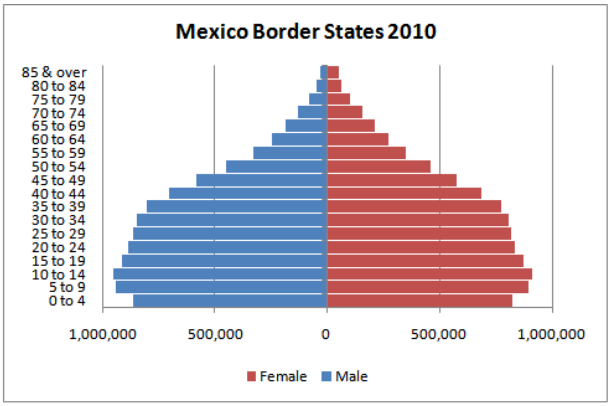


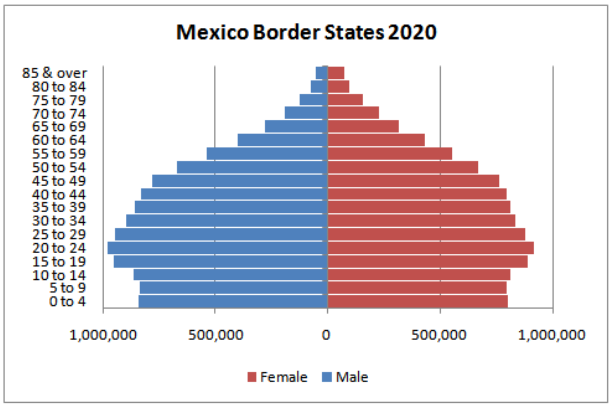












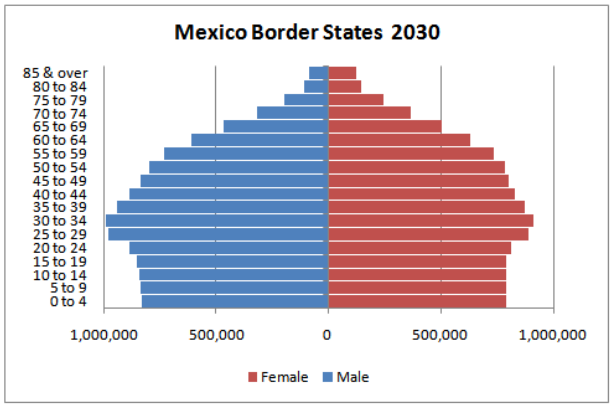
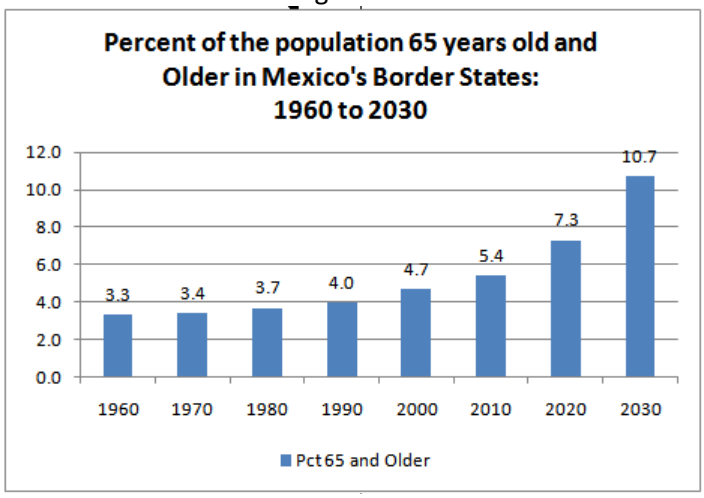


Figure 37



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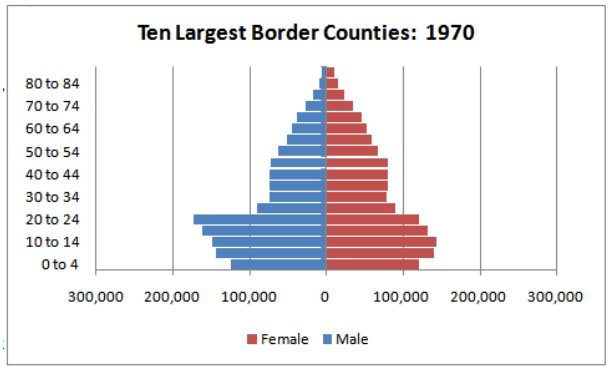

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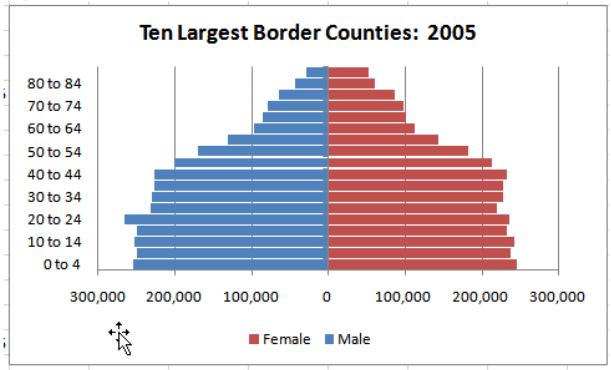

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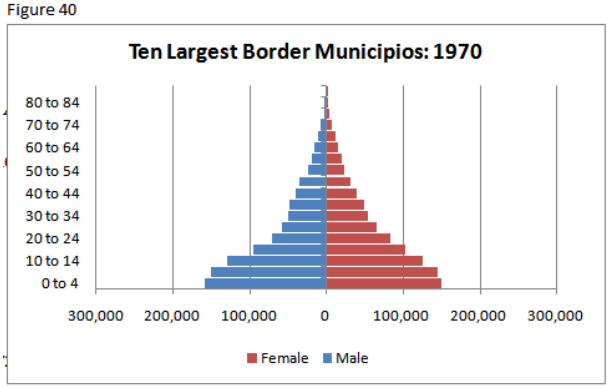

Figure 41