Technical Report Series

Knox County Population Projections 2005-2030

Date:

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2000 Census Data, Knoxville, TN (CD-ROM)

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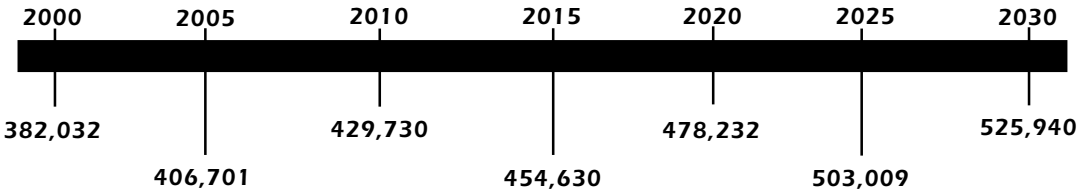
This report contains population projections by age group and gender for the next 30 years based on three growth scenarios.

Population projections comprise a very important analytical tool for planners. In the course of sketching community blueprints, planners rely on forecasts to estimate future demands for roadways, schools, fire protection, and many other services. The most widely used population forecasting technique is the *cohort-component projection*. As the name suggests, the technique calculates population in several age groups (cohorts), based on events affecting the underlying forces of population change: births, deaths, and migration (components).

Two computer models were used to generate population projections for Knox County. The first, *HALLEY*, built a *life table*, summarizing the life expectancies and survival rates of females and males in several age groupings, based on past and present population and mortality figures. Next, the *COHORT* model was run. Its base data included the life table from the *HALLEY* procedure and local statistics on births and migration. Projections of female and male population in several age cohorts were generated for five-year intervals from 2005 through 2030.

Knox County Population Projections, 2005-2030

(Based on Moderate Growth Scenario)



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THREE POPULATION GROWTH SCENARIOS

When preparing population forecasts, planners make basic assumptions about the contributing factors to population growth and change, often incorporating several variations to accommodate different potential outcomes. In this study, three projection series were generated for Knox County (Table 1).

The High Growth scenario resulted in a population increase of 160,000 persons between 2000 and 2030, representing a 41.9 percent change. The Moderate series was more conservative, adding just under 144,000 persons, an increase of 37.7 percent. The Low Growth forecast showed a noticeably slower change in the population, with about 103,000 new persons, or a 26.9 percent increase.

Figure 1: Knox County Population Projection Scenarios: Total Population, 2000-2030

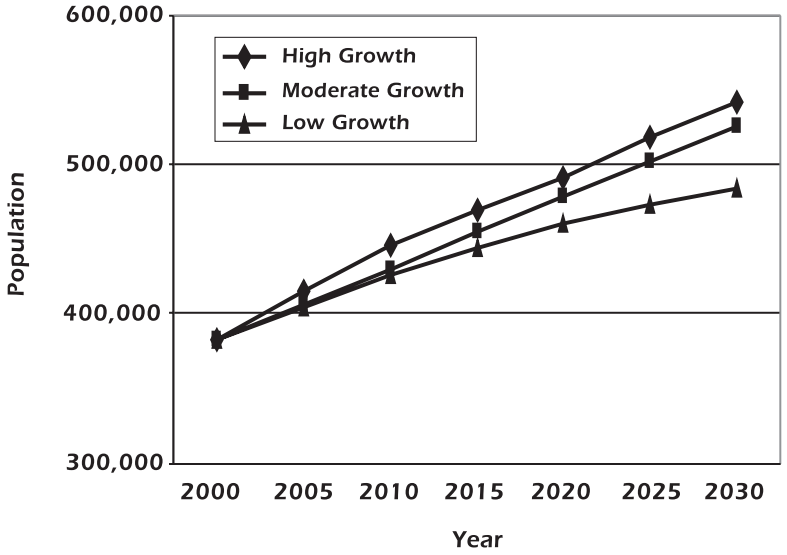
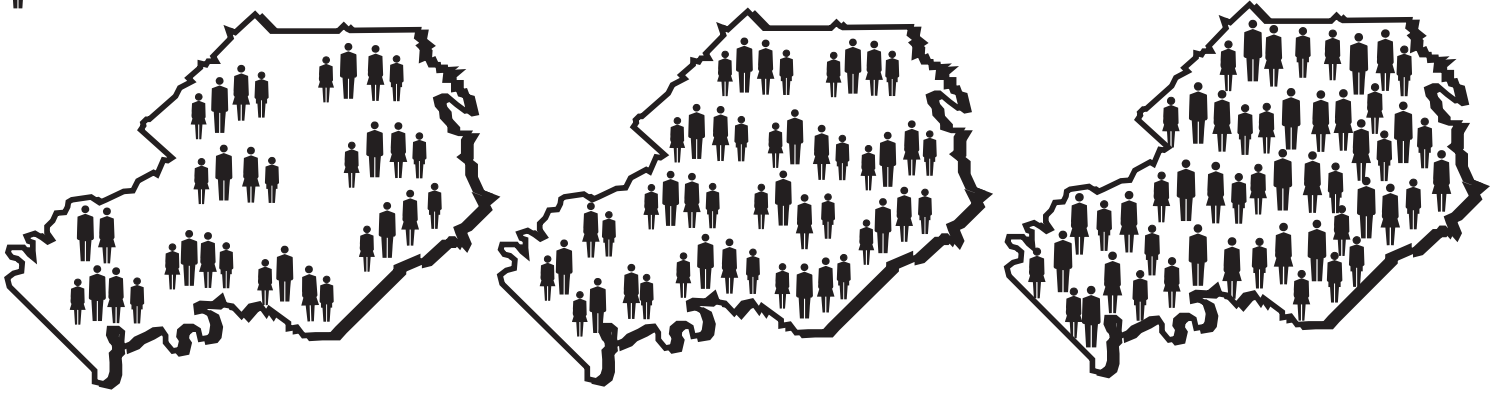


Table 1: Knox County Population Projection Scenarios

Scenario	2000	2005	2010	2015	2020	2025	2030	Change 2000-2030	% Change 2000-2030
High	382,032	414,526	445,484	469,452	491,668	518,025	542,035	160,003	41.9
Moderate	382,032	406,701	429,730	454,630	478,232	503,009	525,940	143,908	37.7
Low	382,032	404,965	426,181	443,471	459,599	473,534	484,701	102,669	26.9

The Scenarios: Low Growth, Moderate Growth, and High Growth

=100 people.



The Low Growth scenario forecasts a countywide gain of 3,400 persons per year through 2030.

The Moderate Growth series predicts the county population will grow by 4,800 persons per year, an increase of nearly 38% over the next 30 years.

The High Growth model foresees the largest countywide population increase of all: 5,300 persons per year, resulting in more than 41% growth by 2030.

The following section offers more details on the forecast series, providing five-year time interval totals for age groups and a brief statement of the assumptions behind each scenario.

Series 1. High Growth

The High Growth forecast was constructed under the assumption that greater job opportunities will arise in Knox County over the next several years, attracting more residents and driving up the population at rates faster than recorded in the past 10 years. Specifically, it was assumed that employment growth would accelerate to 3.0 percent per year between 2000 and 2010, slightly faster than the 2.1 percent annual average recorded during the 1990s. For the remaining 20 years of the forecast period, it was assumed that employment growth would occur at rates consistent with projections made by the Tennessee Department of Labor and The University of Tennessee Center for Business and Economic Research, which tended to reflect rates seen between 1970 and 2000.

Table 2: High Growth Scenario

Age Interval	2000	2005	2010	2015	2020	2025	2030
0-4	23,371	24,877	26,212	23,894	21,795	22,720	23,986
5-19	74,806	80,549	88,287	86,028	88,832	82,977	81,864
20-44	147,365	154,935	159,709	175,730	183,321	204,906	215,850
45-64	88,075	104,194	116,571	121,694	124,481	124,777	126,718
65-74	25,983	26,383	30,359	37,553	45,162	50,817	54,596
75+	22,432	23,589	24,345	24,554	28,076	31,829	39,020
Total	382,032	414,526	445,484	469,452	491,668	518,025	542,035

Series 2. Moderate Growth

For the Moderate Growth forecast, it was assumed that life expectancies, migration, and births will continue throughout the forecast period at the same rates as recorded between 1990 and 2000, the result of documented long-term consistency in two of the components of population change. First, local and national survival rates have remained very stable over the past couple of decades, and demographers do not expect significant change during the next several years. Second, employment growth, one of the major contributors to in-migration, has seen periods of fluctuation in the past 30 years in Knox County, but on average, the overall rate changed very little, ranging between 2.1 and 2.3 percent annually during each decade since 1970.

Table 3: Moderate Growth Scenario

Age Interval	2000	2005	2010	2015	2020	2025	2030
0-4	23,371	24,232	24,923	25,625	26,870	28,097	29,509
5-19	74,806	77,918	82,923	84,089	88,749	90,429	96,236
20-44	147,365	151,480	152,799	164,197	169,524	182,175	187,662
45-64	88,075	103,099	114,381	118,515	120,151	120,503	120,884
65-74	25,983	26,383	30,359	37,649	44,861	49,884	52,838
75+	22,432	23,589	24,345	24,554	28,076	31,919	38,811
Total	382,032	406,701	429,730	454,630	478,232	503,009	525,940

Series 3. Low Growth

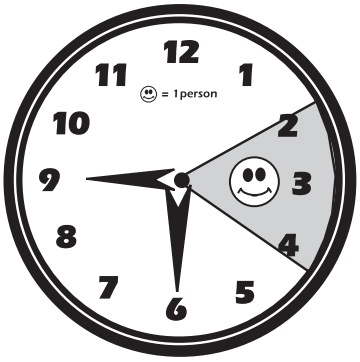
Consistent with nationwide trends, Knox County witnessed declining birth rates over the past several years. The raw number of births remained relatively stable during the 1990s, at an average of 4,695 per year, but the number of females of child-bearing age climbed, resulting in a steadily shrinking child-women ratio (CWR). Birth rates are traditionally cyclical in nature, however, with periods of decline followed by growth or stability. As a result, the Low Growth Scenario accommodated a downward trend of births by introducing a slight reduction in the CWR for the first 10 years of the forecast. Then, a period of stability was built into the model by holding the CWR constant for the remaining 20 years.

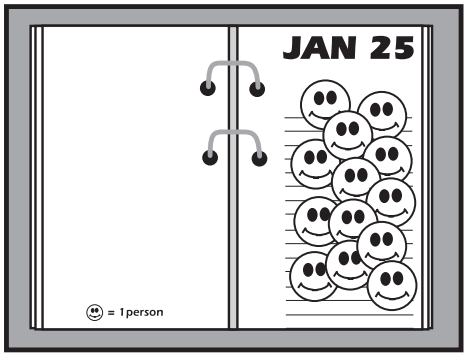
Table 4: Low Growth Scenario

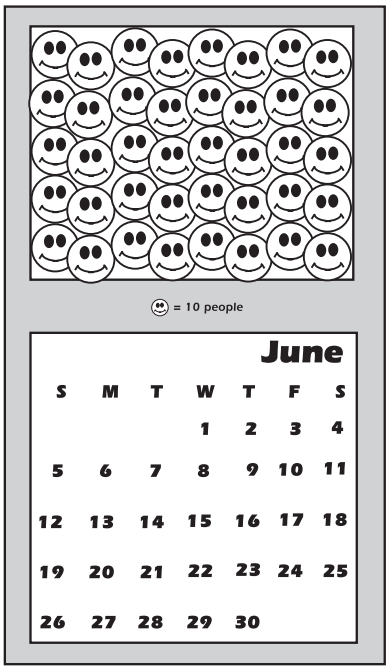
Age Interval	2000	2005	2010	2015	2020	2025	2030
0-4	23,371	23,528	23,475	21,461	19,821	20,026	20,397
5-19	74,806	76,887	80,821	77,095	77,165	72,313	69,583
20-44	147,365	151,480	152,799	164,197	169,524	178,888	182,188
45-64	88,075	103,099	114,381	118,515	120,151	120,503	120,884
65-74	25,983	26,383	30,359	37,649	44,861	49,884	52,838
75+	22,432	23,589	24,345	24,554	28,076	31,919	38,811
Total	382,032	404,965	426,181	443,471	459,599	473,534	484,701

Population Growth Time Line

(Based on Moderate Growth Scenario)



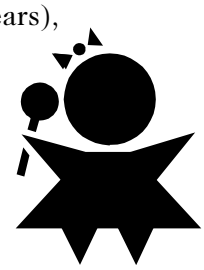




When broken into smaller increments, the Moderate Growth scenario adds a new person to Knox County about every two hours; just over 13 people join the population each day; and the county increases by an average of 400 folks per month. Over the course of a year, that adds up to 4,796 new neighbors!

AGE GROUPS

Considerable differences emerged among age-specific groupings for the three projection scenarios. Most notably, population in the youngest age groups, *pre-schoolers* (ages 0 to 4 years) and *students* (ages 5 to 19 years), showed the greatest variation. The Moderate series had the largest gains in those two age groups, reaching nearly 30 percent growth, while the Low Growth series expected population loss in both, the result of downward adjustments to birth rates built into the forecast model. Based on the Moderate series, about 1,000 new children under age five will be added to the local population every five years, creating modest demand for new day care facilities and related services. Among school-aged children, the Moderate estimates predicted more than 3,500 students will enter the local education system every five years, with a total addition of 21,000 by 2030. The High series produced a peak addition of 14,000 students by 2020, while the Low forecast recorded a 6,000 student gain at its highest point.



The Moderate and Low Growth series showed similarities in the *younger workforce* (ages 20 to 44 years), while the High Growth scenario almost doubled the forecasts of the other two, predicting more than 45 percent growth. The High series model performed as expected in that regard because it was constructed around an assumption that better than average employment growth would occur, drawing working-age newcomers to the county.

All three scenarios returned consistent projections for the oldest population groupings. The number of persons comprising the *recent retirees* grouping (ages 65 to 74 years) will double over the next 30 years, while the *elderly* (ages 75 years and over) also will grow at an impressive rate, almost 75 percent. The remarkable growth among these groups is the result of the aging of the massive Baby Boom population and will place significant demands on specialized transportation, housing, and social services geared to the needs of an elderly population.

Table 5: Population Change (%), 2000-2030

Age Interval	High Growth	Moderate Growth	Low Growth
0-4	2.6	26.3	-12.7
5-19	9.4	28.6	-7.0
20-44	46.5	27.3	23.6
45-64	43.9	37.3	37.3
65-74	110.1	103.4	103.4
75+	73.9	73.0	73.0
Total	41.9	37.7	26.9

GENERATIONAL HIGHLIGHTS

Researchers who study population characteristics often try to determine major time periods, or generations, of identifiable birth trends. People born during a specified period are grouped together and presumed to share common demographic traits. Marketers, planners, and sociologists use that information to predict and interpret population behavior. Currently, there are seven widely-accepted generations of population in the U.S., and the progression of ages of persons in those groups across the 30-year forecast period is summarized in Table 6.

Table 6: Projection Year Ages by Generation
(Birth years shown in parentheses)

Year	GI Generation (pre-1930)	Depression (1930-1939)	War Babies (1940-1945)	Baby Boomers (1946-1964)	Generation X Baby Bust (1965-1976)	Generation Y Echo Boom (1977-1994)	Generation Z Millenials (1995-present)
2000	71+	61-70	55-60	36-54	24-35	6-23	0-5
2005	76+	66-75	60-65	41-59	29-40	11-28	5-10
2010	81+	71-80	65-70	46-64	34-45	16-33	10-15
2015	86+	76-85	70-75	51-69	39-50	21-38	15-20
2020	91+	81-90	75-80	56-74	44-55	26-43	20-25
2025	96+	86-95	80-85	61-79	49-60	31-48	25-30
2030	101+	91-100	85-90	66-84	54-65	36-53	30-35

Highlights of three generations are briefly examined.

Baby Boomers

Perhaps the most visible and influential population group in the U.S. today is the Baby Boom generation (persons born between 1946 and 1964). With the conclusion of World War II, rapid and sizeable economic expansion occurred, creating a period of national prosperity in which birth rates were among the highest in history. Presently, Baby Boomers comprise 30 percent of the total county population (Table 7). By 2030, they will be 66 to 84 years old and represent almost 16 percent of the total (based on the Moderate Growth series). In 2000, by comparison, persons aged 66 to 84 years (Depression and GI Generations) represented only an 11 percent share.

Generation X

The Boomers were followed by Generation X (persons born between 1965 and 1976), the children of the era labeled the *Baby Bust*. This period was defined by military conflicts, social and political unrest, and economic crises that resulted in sharply lower birth rates and a subsequently retracted population cohort. In 2000, Generation X held a 14 percent share of the county's population (Table 7). Their representation is projected to drop throughout the forecast period as mortality outpaces in-migration.

Generation Y

Members of Generation Y were born between 1977 and 1994, comprising an era also known as the *Echo Boom*. When younger members of the Baby Boom generation started having children, they tended to have more kids than the older Boomers. Combined with the sheer numbers of the parent group, the outcome was a mini-boom of population growth. As Generation Y ages, it will maintain its large presence, currently holding a 28 percent share of the county total, and nearly a 26 percent portion through 2030 (Table 7).

The influence of these three generations is readily seen in the overall share of population they hold, combining for 72 percent of Knox County's 2000 total, and their continued dominance throughout the forecast period. As discussed earlier, the size of these generational groups will pose significant challenges for community services and facilities appropriate for an elderly population.

Table 7: Summary of Generational Trends
(Based on Moderate Growth Scenario)

	2000		2005		2010		2015		2020		2025		2030	
Generation	**Pop.**	**%**	**Pop.**	**%**	**Pop.**	**%**	**Pop.**	**%**	**Pop.**	**%**	**Pop.**	**%**	**Pop.**	**%**
Baby Boomers	114,642	30.0	115,607	28.4	114,381	26.6	111,412	24.5	104,894	21.9	95,373	19.0	82,884	15.8
Generation X	55,057	14.4	54,989	13.5	57,609	13.4	58,661	12.9	60,118	12.6	59,894	11.9	56,864	10.8
Generation Y	106,214	27.8	118,761	29.2	126,210	29.4	134,445	29.6	129,112	27.0	130,180	25.9	134,978	25.7
All Population	382,032		406,701		429,730		454,630		478,232		503,009		525,940	

MALE AND FEMALE POPULATIONS

In 2000, there were over 197,000 females and 184,000 males comprising the Knox County population, roughly 93 men to 100 women (Table 8). The areawide average will draw closer in 2015 and 2030 when the ratio will reach 95:100, but many age-specific differences will persist (based on the Moderate Growth scenario). Among the youngest cohorts, boys will outnumber girls across the forecast period, while a balance between the sexes will exist in the population aged 20 to 44 years until 2030. In the older age groups, however, the ratio will change dramatically as the number of females will sharply outpace males, the result of differences in life expectancy. That trend will continue for the next several decades, as demonstrated in recent vital statistics. Male children born in 1998 have a life expectancy of 73.8 years, while females born the same year will live, on average, for 79.5 years, according to the most recent estimates from the Centers for Disease Control and Prevention.

Table 8: Male/Female Populations and Ratios
(Based on Moderate Growth Scenario)

	2000			2015			2030		
Age Interval	**Female**	**Male**	**M:F Ratio 1:x**	**Female**	**Male**	**M:F Ratio 1:x**	**Female**	**Male**	**M:F Ratio 1:x**
0-4	11,263	12,108	0.93	12,412	13,212	0.94	14,294	15,215	0.94
5-19	36,658	38,148	0.96	41,289	42,801	0.96	47,533	48,703	0.98
20-44	74,358	73,007	1.02	82,567	81,630	1.01	93,627	94,035	1.00
45-64	45,620	42,455	1.07	61,028	57,487	1.06	61,785	59,100	1.05
65-74	14,741	11,242	1.31	20,102	17,547	1.15	28,555	24,283	1.18
75+	14,815	7,617	1.94	15,654	8,899	1.76	23,606	15,205	1.55
Total	197,455	184,577	1.07	233,052	221,578	1.05	269,399	256,541	1.05

Reading the ratios:
1:x is read as 1 male for x females. For example, in the 20-44 age interval for 2000, there is 1 male for every 1.02 females.

ADDITIONAL INFORMATION

In addition to population projections, the Metropolitan Planning Commission assembles and maintains an extensive collection of other demographic data products, like population profiles, thematic maps, and summary spreadsheets covering Knoxville, Knox County, and the metropolitan area. Contact the MPC library or visit the Web site (www.knoxmpc.org) for more information.

Forecasting Models

Levine, N. 1988. *HALLEY: A Population Analysis Program, Version 3.2*. Instructions for use of the model were detailed in Levine, N. 1985. The Construction of a Population Analysis Program Using a Microcomputer Spreadsheet. *APA Journal*, Vol. 51, No. 4.

Levine, N. 1993. *COHORT: Cohort Component Population Projection*. Instructions for use of the model were detailed in Klosterman, R., Brail, R., and Bossard, E., eds. 1993. *Spreadsheet Models for Urban and Regional Analysis*. Center for Urban Policy Research, New Brunswick, NJ.

Data and Sources

1990 population, in 5-year age cohorts, by gender. (Source: U.S. Census Bureau. 1993. *1990 Census of Population and Housing, Summary File 1*.)

2000 population, in 5-year age cohorts, by gender. (Source: U.S. Census Bureau. 2001. *2000 Census of Population and Housing, Summary File 1*.)

Current (1998) mortality, in 5-year age cohorts, by gender. (Sources: TN Department of Health/UTK Community Health Research Group. 2001. *Health Information Tennessee (HIT)* and *Statistical Profiling of Tennessee (SPOT)*.)

1990 through 1999 births/fertility rates. (Sources: TN Department of Health/UTK Community Health Research Group. 2001. *Health Information Tennessee (HIT)* and *Statistical Profiling of Tennessee (SPOT)*.)

1990 through 1999 migration. (Source: U.S. Census Bureau. 2000. *Population Estimates Program*.)

Current employment/estimated employment growth. (Sources: TN Department of Labor and Workforce Development, Employment Security Division, Research and Statistics Section. 2000. *Tennessee Job Outlook, 1998-2008*; Center for Business and Economic Research, College of Business Administration, The University of Tennessee, Knoxville. 2001. *An Economic Report to the Governor of the State of Tennessee: On the State's Economic Outlook*.)