Impacts of Current and Future Demographic Change on Transportation Planning in Texas

by

Steve Murdock, Michael Cline, Jolanda Prozzi, Rick Ramirez, Alan Meers, John McCray, and Robert Harrison

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IMPACTS OF CURRENT AND FUTURE DEMOGRAPHIC CHANGE ON TRANSPORTATION PLANNING IN TEXAS
Second Year Interim Technical Report 0-5392-3

Conducted for the Texas Department of Transportation

In cooperation with the
U.S. Department of Transportation
Federal Highway Administration

By the

INSTITUTE FOR DEMOGRAPHIC AND SOCIOECONOMIC RESEARCH
THE UNIVERSITY OF TEXAS AT SAN ANTONIO
AND
THE CENTER FOR TRANSPORTATION RESEARCH
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16. Abstract: As Texas population continues to grow and as the complexities of that growth change the fundamental demographic structure of the state, transportation planners will need a better understanding of demographic data and its implications. This report provides an overview of demographic change shaping the State of Texas and analyses of how these impacts may shape transportation.			
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Executive Summary

On a daily basis, drivers come face to face with some of the demographic changes occurring in Texas. In urban areas, drivers experience roadway congestion as a result of rapid population growth and suburban expansion. In other areas of the state, declining populations can be seen through fewer passing drivers. At the same time, the people we pass along the road are more racially and ethnically diverse, and many are older than what we may have seen 40 years ago. What do these changes mean for transportation in Texas and for the Texas Department of Transportation (TxDOT)? The goal of this report was to examine some of the implications of population and demographic changes. In general, these implications were examined by applying historic rates of transportation related factors onto two sets of population projections – one that assumes that the rapid population growth experienced by Texas during the 1990s continues through 2040 (Scenario 1.0), and another which assumes that a more moderate pace of growth experienced during the post-2000 period continues through 2040 (Scenario 2000-2004). In sum, in regards to demographic change, the State of Texas and the Texas Department of Transportation is faced with several major challenges that have different implications for transportation policy. These findings, conclusions, and implications are summarized here and expanded in the following chapters. A more detailed summary of findings, conclusions, and implications can be found in Chapter 8. Among the major findings in this report are the following:

Relative to General Patterns of Population Growth and Distribution

- The State of Texas will continue to experience rapid population growth, increasing in size from 20.9 million people in 2000 to between 43.6 million and 51.7 million. This is an increase of between 109 and 148 percent between 2000 and 2040.
- Despite continued population growth overall, some areas will grow more rapidly than others while some may even experience population decline. As a result, over 70 percent of the population will live within the 5 largest TxDOT districts of Houston, Dallas, San Antonio, Austin, and Fort Worth by 2040 (up from 64 percent in 2006). During the same period, from 2 to 6 districts will experience population declines under the two population projection scenarios examined in this report.
- By 2040, the population will become even more metropolitan oriented than it is today with an estimated 91 percent of the population living in metropolitan areas by 2040.
- If recent trends of suburban population growth continue, the proportion of the population living in suburban counties will increase to 36 percent in 2040 from 18 percent in 2000.
- The magnitude of the changes projected will substantially increase transportation demand especially in suburban areas of the State where growth is already challenging the transportation infrastructure. In rural areas, more stagnant patterns of growth, and in some cases decline, are likely to lead to challenges in maintaining roadway systems with reduced populations, and related resources.

Relative to Changing Population and Household Characteristics

- The population 65 years of age and older will increase markedly compared to the population as a whole from 9.9 percent of the total population in 2000 to about 16 percent of the population by 2040. Whereas the total population will increase from between 109 to 148 percent, the population 65 years of old will increase from between 220 and 273 percent from 2005 to 2040. Thus, the total population 65 and older will grow from 2.2 million in 2005 to between 7.1 and 8.2 million in 2040.

- During the same time, Texas population will become more racially and ethnically diverse than it is today. By 2040, the Texas population is projected to be between 24 and 25 percent Anglo, about 8 percent African-American, 58-59 percent Hispanic, and about 9 percent of Other racial/ethnic groups. TxDOT districts will vary in how rapidly they diversify but the percent of the total population that is Anglo will decrease in every district under each of the two scenarios presented in this report.

- In general, recent trends in households have shown their numbers to be growing faster than the total number of people until the 1990s, to be decreasing in size and to be showing larger percentage increases in non-family than in family households with the largest increases of all in single-adult family households. The extensive growth of the Hispanic population which has larger households and households that are more likely to be made up of married-couples is projected to largely reverse the pattern of the 1990s. At the same time, because of the differences in the distribution of households by race/ethnicity across income categories, the socioeconomic affect of the projected household change is to increase the number of low income and decrease the number of high income households. Household change in Texas will likely have both direct effects on factors such as transportation because family households tend to use fewer services per person than non-family households and indirectly because non-family households tend to have lower levels of socioeconomic resources.

- Overall, the projected change in the race/ethnicity, age, and household characteristics of the Texas population may impact transportation because non-Anglos are less likely to own vehicles and drive fewer miles than Anglos; because slower growth is projected to occur in younger than older populations resulting in potential changes in off-peak travel volumes and increased demand for medical and public transportation; and because the larger household size of non-Anglo households will decrease the higher rate of growth in the number of households which might otherwise occur while reducing per-household resources to pay for transportation and other services.

Relative to Specific Dimensions of Transportation Demand and Use

The demographic trends summarized above are also examined in this volume relative to specific dimensions of transportation. Those examined include impacts on the commuting patterns of workers in Texas, effects on the number of drivers and driver-related crashes, the effects on vehicle ownership and transportation expenditures, the implications for public transportation, and the implications for TxDOT's own workforce recruitment and other employment-related activities.

Among the key findings related to these factors are the following:

- Population growth will lead to a larger number of drivers using Texas roads and to an aging and increasingly diverse population of drivers. Between 2000 and 2040, the number of drivers will increase by 22.2 million (165.2 percent) under the high (1.0) scenario and by 16.8 million (124.9 percent) under the slower (00-04) growth scenario, rates of growth expected to exceed the 148 and 109 percent growth projected for the population.

- The number of drivers aged 65 years and older will increase in conjunction with an aging population. These older drivers will increase from an estimated 1.8 million in 2005 to between 5.7 and 6.6 million drivers. This is an increase of between 218 and nearly 268 percent, changing the percentage of all drivers who would be 65 years of age or older from 12 percent of all drivers in 2005 to an estimated 19 percent of all drivers by 2040.

- The characteristics of drivers will also diversify from 45 percent non-Anglo in 2005 to between 72 and 73 percent non-Anglo by 2040 with between 55 and 56 percent of all

drivers being Hispanic. Similar to the population characteristics as a whole, the proportion of all drivers who will be Hispanic will be especially high at younger ages. The percent Hispanic exceeds 66 percent among drivers less than 35 years of age, 63 percent for drivers 35-44, and over 50 percent among drivers 45-64 years of age but only 33 percent among drivers over 65 years of age.

- From 2000 to 2040, the number of commuters in Texas will increase substantially from 9.2 million in 2000 to between 18.7 and 22.2 million (percentage increases of between 104 and 142 percent) by 2040 and the proportion living and working in the same county will decrease from 78 to 70 percent. Although central city counties will continue to have the largest number of commuters in the future under either projection, under both projection scenarios the largest numeric and percentage changes will be in the number of commuters from large suburban county resident areas. By 2040 (under either projection scenario), at least 3l percent of all commuters (compared to less than 17 percent in 2000) will reside in suburban counties, an increase of nearly 5.5 million and 350 percent from 2000 to 2040.

- Demographic change will affect the total number of miles driven in personal occupancy vehicles. A larger proportion of people in the driving ages will mean that there will be more vehicle miles of travel (VMT) in the aggregate. Demographic change will mean that VMT will increase from 184 billion in 2005 to between an estimated 329 and 456 billion VMT by 2040, an increase of between 79 and 148 percent. Because drivers age 65 and older tend to drive fewer miles, increases in the proportion of drivers in these age groups will decrease daily VMT per driver slightly.

- The number of crashes will also be affected by demographic change. Because the rate of crashes decreases with age, the projected aging of the population will lead to lower crash rates but to substantial increases in the number of crashes among particular age groups. The number of drivers involved in crashes will increase from between 91 to 127 percent from 2005 to 2040, less than the 107 to 144 percent increase in the number of drivers. At the same time, the percentage increase in the number of drivers 65 years of age and older involved in fatality crashes will increase by between 231 percent and 284 percent (compared to rates of growth in the number of such drivers of between 218 and 268 percent).

- The results of the analysis of expenditures indicates that unless changes occur which alter the income and related expenditures of the most rapidly growing segments of Texas population--older and more diverse population groups--the net effect of population change will be to reduce the per household rates of expenditures on transportation in Texas compared to those in 2000. According to these projections, although transportation expenditures will increase more rapidly than total household expenditures, the increases in transportation expenditures (in 2000 constant dollars) will be less than the projected increases in the number of households of between 128 and 167 percent. Thus transportation expenditures per household will decline from roughly $7,600 per household in 2000 to approximately $7,100 in 2040 (in 2000 constant dollars), a decline of $500 dollars, or 7-8 percent in real dollar terms. When examined by type of transportation expenditure, it is evident that the largest projected increases in expenditures under the projected population structure of Texas is projected to occur in public transportation which increases between 125 and 163 percent from 2000 to 2040 compared to the 114 to 151 percent increases in total transportation expenditures. In sum, except for expenditures for public transportation, the projected population change will likely reduce expenditures on transportation in Texas at the same time that increased demand may increase transportation costs.

- Demographic change will increase the number of persons who will be dependent on public transportation. Roughly 93 percent of all households had one or more vehicles available to the household in 2000 but the availability varies by age and race/ethnicity. Whereas in 2000 only 6 percent of all households with a householder 15 to 64 did not have a vehicle available to the household, that percentage varied from 3.1 percent of Anglo households to 13.9 percent of Black households and 8.8 percent of Hispanic households and 5.6 percent of households with a householder who was from an Other racial/ethnic group. Similarly the percentage of households without a vehicle available among households with a householder who was 65 years of age or older varies from 9.7 percent for Anglo households to 28.0 percent for African-American and 25.8 percent of Hispanic households with an elderly householder. If such trends continue, by 2040 there will be between 1.2 and 2.0 million households (10 percent) without vehicles compared to 544,585 in 2000 (7 percent), an increase of between 218 and 272 percent.
- The aging of the population coupled with higher rates of disability among some non-Anglo populations will lead to increased levels of demand for specialized transportation. Projections of the number of disabled persons suggest that such demand will exceed the rate of growth of population as a whole with the number of individuals with out-of-home disabilities who are 16 to 64 years of age increasing by between 141 and 182 percent from 2000 to 2040 while the number of elderly with disabilities increases by between 277 and 334 percent.
- Because of differences in ridership between Anglo and non-Anglo groups, demographic changes will mean that the total number of public transit riders on the journey to work could increase from 162 per 1,000 in 2000 to between 417 and 497 riders per 1,000 in 2040, by between 156.7 and 206.4 percent.
- Although technological, contracting and other factors may lead to less sharp increases in the number of TxDOT employees in the future, if the number of TxDOT workers continues to track population change, TxDOT could need between 17,400 workers under a projection of slower population growth (the 2000-2004 scenario) and increased efficiency relative to population and 32,000 assuming the same ratios of TxDOT employees to population as in 2006 and a higher level of projected population growth (1.0 scenario). Although this is a wide range, it is likely that TxDOT workforce will show at least some increases and will have extensive replacement due to retirement. If TxDOT wishes to have a workforce that reflects the population of Texas, extensive efforts will be needed to recruit more women and non-Anglo professionals at all job levels. For example, to reflect the State's racial/ethnic categories by 2040 even with the current legislatively capped size of 14,700, TxDOT would need to replace approximately 5,000 Anglos with an equal number of Hispanics. TxDOT has implemented an extensive program to meet these needs but it is clear that the agency will face extensive challenges in both meeting its technical requirements and in attaining a workforce that better reflects the Texas population.

Conclusions and Implications

The overall findings suggest several broad conclusions with extensive implications. These conclusions and implications are presented below. In presenting these broad conclusions and implications, the authors recognize that a large number of economic, social, political, and other factors may alter them and that their perspective is limited by their experience and academic bases. In particular, the authors are primarily demographers and do not have the technical base of knowledge regarding transportation infrastructure possessed by many TxDOT professionals. In sum, these

conclusions should be examined with full realization of the limitations of the authors. We present these as major challenges likely to impact Texas and TxDOT.

The challenges include:

The Challenge of Growth

Although it is obvious, as we examine the implications of other dimensions of demographic change, we tend not to pause sufficiently to recognize the significance of population growth in Texas. Texas past and projected future population growth is simply extraordinary but not unprecedented. Texas population roughly doubled in the 40 years from 1930 to 1970, a period which included the great depression and both WWII and the Korean War, and doubled again in the 35 years from 1970 to 2005. As a result, the slower of the two levels of projected growth which more than doubles the population of the State to nearly 44 million by 2040 would not be an unprecedented level of growth relative to Texas historical patterns. At the same time, it would entail adding another nearly 23 million people to Texas population. The 1.0 scenario would increase the population by roughly 1.5 times the population in 2000 and add nearly 31 million new persons to Texas 2000 population, and this growth, although extensive, is possible given Texas recent demographic history.

Such magnitudes of growth simply stress, and in some cases over stress governmental structures. Although a level of growth in transportation infrastructure equal to the rate of projected population growth is neither likely, nor perhaps even possible, a level of transportation infrastructure development equal to doubling present capacity would represent a phenomenal effort. Technological and other developments will alter the level of demand and the resources necessary to address them but it is essential to begin any examination of what population change means for transportation by simply recognizing the sheer magnitude of the changes needed to simply meet population-growth related demands.

What is equally important relative to this challenge is that of recognizing that meeting the transportation challenges may well be the key to the achievement of the levels of growth projected for Texas. Population projections like those made in other areas are made under the assumption that everything else (including economic development) will occur as it has in the past. If transportation infrastructure cannot be provided as needed the transportation system could, together with other factors, lead to a slowdown in Texas economic and demographic growth. It is essential then to realize that meeting the transportation challenge resulting from population growth may well be essential to the demographic and economic development of Texas.

The Challenge of Population Distribution

The challenge of where population growth is occurring is also significant. Growth is moving increasingly to suburban areas while at the same time, nonmetropolitan areas are, in many cases, struggling to maintain their populations. Among the challenges created by these patterns of population distribution is that of providing levels of services in rural areas sufficient to maintain the transportation infrastructure while at the same time meeting the demands for new infrastructure in the most rapidly growing areas of Texas.

Among the other challenges to TxDOT may be that of evaluating whether its organizational and geographic bases of service delivery require a re-evaluation given the realities created by past patterns of growth and those likely to characterize the future and considerations of the challenge of actuating any changes that are identified as necessary.

The Challenge of an Aging Population

The aging of the Texas population presents its own set of challenges. The number of elderly will substantially increase the number of older drivers and with that increase the number of crashes and the number of people requiring specialized transportation for those with disabilities. However,

there is yet other challenges created by an aging population that is more likely to be on fixed incomes and hesitant to increase their level of household expenditures. In those areas where high proportions of the elderly live, or move into to live, the ability to raise additional resources for transportation (and other) services may be more difficult. Maintaining a mix of services that ensures the support of the elderly population may be increasingly important in the coming years.

The Challenges of Increased Diversity

Many of the factors impacted by diversity have been identified in this volume but others are more difficult to quantify but require some discussion. Among these are the need to not only recognize but to incorporate more inclusive cultural, linguistic, and social practices in TxDOT's and other organization's corporate cultures. This is not an evaluation of existing patterns in TxDOT, because no such evaluation has been completed, but rather a recognition that changes in racial/ethnic composition of the magnitude identified above will likely require corporate change in both public as well as private-sector entities throughout Texas.

The challenges of diversity also include elements beyond the control of TxDOT but are clearly extensive challenges for all of Texas. Public and private-sector organizations in Texas with large technical components in their workforce activities need access to well educated non-Anglo populations. Texas is presently producing an insufficient supply of such workers in part because dropout levels and other factors remain very high. This is a very extensive challenge because of the magnitude and the current differentials in education. For example, in Texas in 2000, whereas 30 percent of adult Anglos had a college degree, only 15.3 percent of African-Americans and 8.9 percent of Hispanics had such degrees. Unless the State is able to increase the number of non-Anglo engineering and other graduates substantially it will be difficult for agencies such as TxDOT to reach their diversity goals.

Even more important, unless the most rapidly growing segments of the population obtain the educational levels necessary to compete effectively in the increasingly international labor force, Texas is likely to become poorer and less competitive (Murdock et al. 2003). The historical, discriminatory and other factors that have led to such educational and related socioeconomic differences must not be allowed to limit the production of an educated workforce that can create a competitive and more prosperous Texas.

The challenges created if Texas fails to educate and create a competitive workforce are extensive for transportation and other services as well. One of the most basic challenges is that the increased demand for services created by the growth in the size of the population may not be matched by a commensurate increase in the resources to pay for such services. This was noted above in relationship to household expenditures on transportation but its ramifications are extensive.

The lack of sufficient financial resources to pay for service demands may lead to continuing budget short falls and to a need to search for alternative forms of funding for transportation infrastructure. At the same time, the lack of resources in large segments of the population may create resistance to solutions that require larger household expenditures coupled with resistance to the provision by a public agency of different levels of services to different segments of the public, no matter how they are financed.

The Challenge of An Aging and Diverse Population

There are also potential impacts likely to result from the concurrence of both aging and diversity at the level projected for the Texas population. Texas projected growth is likely to produce an older population that is largely Anglo coupled with a younger population that is largely non-Anglo, particularly Hispanic. This composition seems likely to accentuate support for some types of transportation services, lead to conflicts in regard to others, and to lead to patterns that interactively limit yet other transportation services.

The fact that non-Anglo populations are more likely to live in zero vehicle households and the elderly to be somewhat less likely to drive and to have increasing numbers who will need specialized transportation may lead to an increase in political support by both groups for public transportation. A coalition based on need may lead to areas of cooperation between these groups that overcome racial/ethnic and age differences and accentuate the support for public transportation.

For a second set of services, the fact that non-Anglos are likely to be younger and needing more transportation services related to work and family activities that require additional transportation expenditures while the Anglo elderly are at life stages that make them hesitant to increase expenditures and less likely to use such services may lead to opposition between these groups in areas where there are few perceived direct benefits for the elderly. In such circumstances the confluence of age and race/ethnicity differences may lead to conflicting perspectives.

On yet a third set of factors, the aging Anglo and younger non-Anglo populations may come to act concurrently to limit services. Such might be the case in service areas that are largely used by middle-aged and middle class Anglo constituencies. Although this set of individuals may well have the resources to directly pay for the services they wish to obtain, the financial constraints of the budgets of many elderly and non-Anglo households may make both population segments hesitate to support services that are not directly beneficial to them and that they see as deflecting a public agency from activities that promote more generalized public services.

Limitations

We realize that the characteristics of the future will not be determined by demographic changes alone. However, our goal for the analyses presented in this report is to understand how demographic changes may impact transportation service demand should the trends continue in the absence of any actions to change these trends. For this reason, our analysis is limited to one dimension among many. In addition, the data prepared for this report assumes that differences in age, household composition, and race/ethnicity tend to differentiate the socioeconomic resources available to persons and households. We do not suggest that these relationships are unchangeable but rather, these differences have prevailed over time for a variety of historical, discriminatory, and other factors. This assumption is used in the absence of other more direct indicators to assess likely socioeconomic change. Like any research of this type, we were not able to explore all dimensions of transportation service demand due to the limitations of time, resources, and data available. In some chapters, we explore sub-state level changes while in others we were limited by the data to state-level analyses. In addition to these general limitations, we provide an overview of specific limitations in the data and methodology within the context of each chapter.

With full recognition of these limitations, we hope that the following chapters provide the reader a greater appreciation for the demographic changes that have impacted the State and those that may have significant influence on transportation in Texas in the foreseeable future.

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Chapter 1

Total Population Change and Population Distribution

Population Change for the State of Texas

In 1920, three years after the formation of the Texas Highway Department, the forerunner of today's Texas Department of Transportation (TxDOT), there were 4.7 million people living in the State of Texas, a number slightly smaller than the total population living in TxDOT's Houston District today[1]. In every decade since, Texas' rate of population growth has exceeded that for the nation and its recent population increases have been particularly large. In the 1990s, Texas was the second fastest growing state in numerical terms (behind California) and the eighth fastest growing in percentage terms (U.S. Bureau of the Census 1991 and 2001). By 2000, the State's population had reached 20.9 million people (Table 1-1). In the post-2000 period from April 1, 2000, (the 2000 Census date) to July 1, 2006, it was the fastest growing state in numeric terms (in part because of Katrina evacuees but even without evacuees it would have had the second largest numerical increase) and was the seventh fastest growing in percentage terms. The size of Texas' population has more than doubled in the past 35 years, increasing from roughly 11.2 million in 1970 to nearly 23.5 million in 2006. In the 1990s its percentage increase of 22.8 resulted in a population increase of nearly 3.9 million people. This increase was roughly equivalent to having added the number of people who in 1990 lived in the Houston and Lufkin TxDOT districts combined, or more than the total population of 24 of the 50 states and meant that roughly one of every nine persons added to the population of the United States in the 1990s was added in Texas. In the post-2000 period population growth has continued with an increase in Texas' population of nearly 2.7 million from April 1, 2000, to July 1, 2006 (U.S. Bureau of the Census 2007). This level of growth, if continued, will mean that Texas' population increase from 2000 to 2010 will likely be between 3.6 and 4.0 million people and that between 24.3 and 26.1 million people will live in Texas in 2010. If trends from the past are indicative of those for the future, then Texas' population will continue to grow and change rapidly and such changes will have substantial impacts on the Texas transportation system and the Texas Department of Transportation (TxDOT).

However, neither the amount nor the rate of population change has been uniform across Texas. Some areas have grown significantly while others have lost population. In order to understand the current distribution of Texas' population, we provide a summary of current and historical patterns of total population change for the twenty-five TxDOT districts. The population of Texas continues to concentrate in metropolitan areas of Texas, where the most rapid population growth has occurred. We therefore follow our discussion of district changes with an overview of population changes at the county level, emphasizing differences in population change according to county metropolitan status and metropolitan proximity. In order to understand the potential impacts of future population changes, we then provide an overview of population changes to 2040 using two different population projection scenarios. We discuss the potential changes in the distribution of Texas' population according to the same geographic levels as those presented in our current and historical summary. Finally, we conclude with an assessment of how these changes could impact the transportation system and the Texas Department of Transportation.

[1] The Houston District includes Brazoria, Ft. Bend, Galveston, Harris, Montgomery and Waller Counties.

Table 1-1:
Total Population and Percent Population Change
in Texas and the United States, 1910-2006

Year	Total Population		Percent Change from Previous Time Period	
	Texas	U.S.	Texas	U.S.
1910	3,896,542	91,972,266	27.8	21.0
1920	4,663,228	105,710,620	19.7	14.9
1930	5,824,715	122,775,046	24.9	16.1
1940	6,414,824	131,669,275	10.1	7.2
1950	7,711,194	150,697,361	20.2	14.5
1960	9,579,677	179,323,175	24.2	19.0
1970	11,196,730	203,302,031	16.9	13.4
1980	14,229,191	226,545,805	27.1	11.4
1990	16,986,510	248,709,873	19.4	9.8
2000	20,851,820	281,421,906	22.8	13.2
2006	23,507,783	299,398,484	12.7	6.4

*Population as of April 1 of the indicated year except 2006. Values for 2006 indicate population as of July 1, 2006 as estimated by the U.S. Bureau of the Census.

Source: U.S. Bureau of the Census.

Population Change by TxDOT District

The 254 counties of Texas are assigned to one of twenty-five administrative districts of TxDOT (see Figure 1-1). In 2006, the total population of these districts ranged in size from 39,924 (Childress) to 5.4 million (Houston). Over 1 million people lived within the boundaries of each of six districts including Austin, Dallas, Fort Worth, Houston, Pharr, and San Antonio (Table 1-2). The remaining nineteen districts averaged an estimated 377,445 people in 2006. When comparing population change by TxDOT district, seven districts grew at faster rates than the State as a whole between 1980 and 2006 (Table 1-3). These districts are located along the Texas-Mexico border (Laredo, Pharr) and in the major metropolitan complexes of Dallas-Fort Worth, Austin-San Antonio, and Houston. The TxDOT district with the largest growth in percentage terms during this period was the Austin district (152.1%), followed by the Pharr district (at 114.4%). Other TxDOT districts that had rates of growth larger than the State of Texas, included Dallas (99.7%), Fort Worth (96.4%), Laredo (79.2%), Houston (76.3%), and San Antonio (66.6%). Only the Childress district lost population during this same period (-25.7%), although several others have experienced only limited growth since 1980. An additional 17 of the 25 TxDOT districts increased their populations at rates below the State level. Overall data on population change in TxDOT districts reflect Statewide patterns of population distribution with change concentrated in the Dallas-Fort Worth, Houston, and San Antonio corridors and along the South Texas/Mexico border. In numeric terms, three districts have added over 1 million people from 1980 to 2006, including Houston (2.3 million), Dallas (2.0 million), and Fort Worth (1.0 million). Over 500,000 people were also added to the districts of Austin (982,000), San Antonio (813,000), and Pharr (639,000) between 1980 and 2006 (Table 1-4).

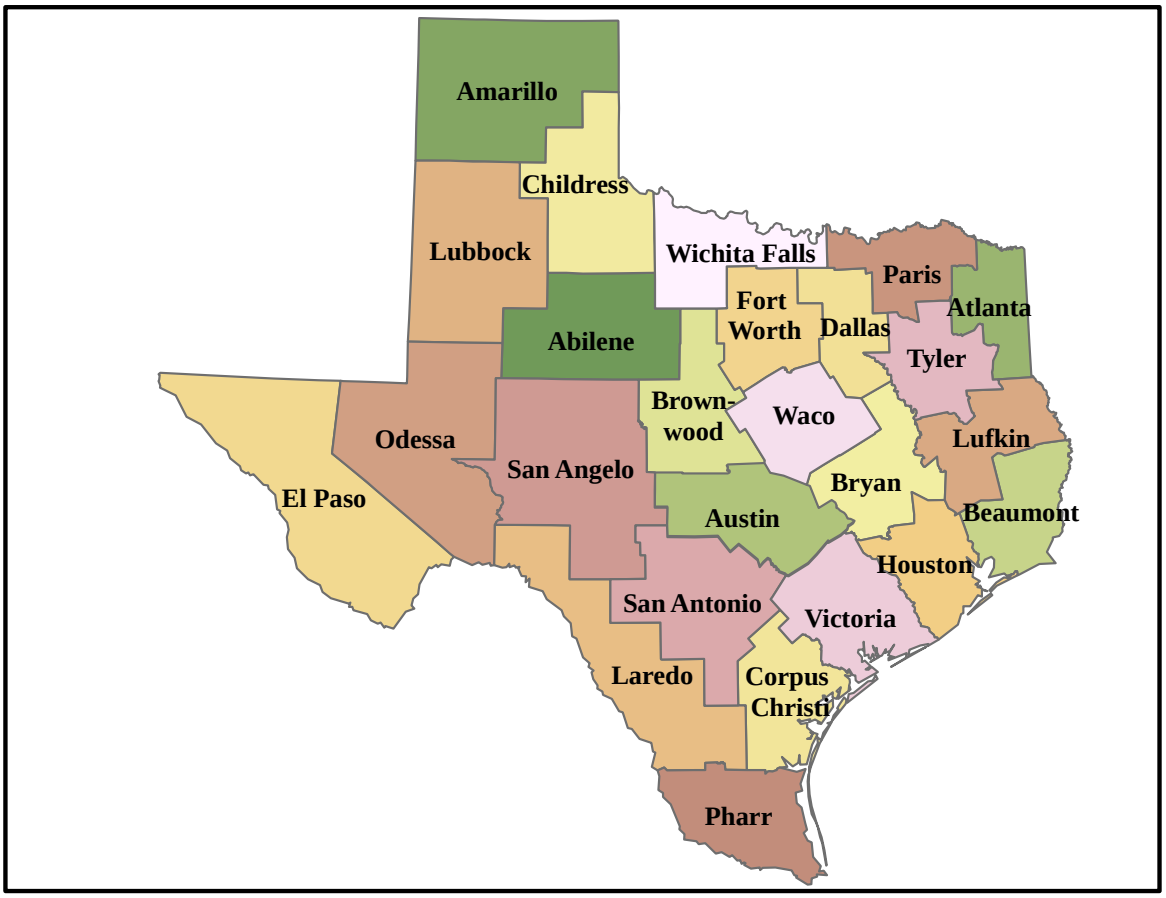

Figure 1-1: Texas Department of Transportation Districts

Table 1-2:
Total Population and Percent Change in TxDOT Districts 1980-2006

	Population				Percent Change			
District	**1980**	**1990**	**2000**	**2006**	**1980-90**	**1990-00**	**2000-06**	**1980-06**
Abilene	238,914	242,391	252,753	246,310	1.5	4.3	-2.5	3.1
Amarillo	314,824	319,913	350,605	363,803	1.6	9.6	3.8	15.6
Atlanta	262,021	279,632	303,557	312,829	6.7	8.6	3.1	19.4
Austin	645,846	919,988	1,349,581	1,627,982	42.4	46.7	20.6	152.1
Beaumont	501,381	495,357	552,822	554,044	-1.2	11.6	0.2	10.5
Brownwood	116,940	117,191	126,210	129,422	0.2	7.7	2.5	10.7
Bryan	255,726	309,257	370,948	386,857	20.9	19.9	4.3	51.3
Childress	53,699	43,595	42,625	39,924	-18.8	-2.2	-6.3	-25.7
Corpus Christi	474,055	496,841	549,025	562,050	4.8	10.5	2.4	18.6
Dallas	1,992,701	2,593,288	3,414,427	3,980,040	30.1	31.7	16.6	99.7
El Paso	500,350	615,196	704,318	761,231	23.0	14.5	8.1	52.1
Ft. Worth	1,075,611	1,461,100	1,827,017	2,112,675	35.8	25.0	15.6	96.4
Houston	3,054,205	3,658,317	4,573,386	5,384,318	19.8	25.0	17.7	76.3
Laredo	209,909	252,224	329,483	376,082	20.2	30.6	14.1	79.2
Lubbock	420,300	413,263	429,458	436,534	-1.7	3.9	1.6	3.9
Lufkin	219,119	244,135	284,315	298,618	11.4	16.5	5.0	36.3
Odessa	281,261	307,723	311,458	321,823	9.4	1.2	3.3	14.4
Paris	269,404	290,641	337,130	359,394	7.9	16.0	6.6	33.4
Pharr	558,484	724,940	1,004,222	1,197,551	29.8	38.5	19.3	114.4
San Angelo	134,267	147,503	154,379	151,981	9.9	4.7	-1.6	13.2
San Antonio	1,220,443	1,481,678	1,798,385	2,033,770	21.4	21.4	13.1	66.6
Tyler	444,472	514,932	593,394	640,570	15.9	15.2	8.0	44.1
Waco	470,303	533,086	624,850	659,070	13.3	17.2	5.5	40.1
Wichita Falls	224,982	227,938	245,566	242,006	1.3	7.7	-1.4	7.6
Yoakum	289,974	296,381	321,906	328,899	2.2	8.6	2.2	13.4
State of Texas	***14,229,191***	***16,986,510***	***20,851,820***	***23,507,783***	***19.4***	***22.8***	***12.7***	***65.2***

Source: Derived from U.S. Bureau of the Census. Population as of April 1 of the indicated year except 2006. Values for 2006 indicate population as of July 1, 2006 as estimated by the U.S. Bureau of the Census.

Table 1-3:
TxDOT Districts Ranked by Percent Change in Total Population, 1980-2006

		Population				Percent Change			
Rank	**District**	**1980**	**1990**	**2000**	**2006**	**1980-90**	**1990-00**	**2000-06**	**1980-06**
1	Austin	645,846	919,988	1,349,581	1,627,982	42.4	46.7	20.6	152.1
2	Pharr	558,484	724,940	1,004,222	1,197,551	29.8	38.5	19.3	114.4
3	Dallas	1,992,701	2,593,288	3,414,427	3,980,040	30.1	31.7	16.6	99.7
4	Ft. Worth	1,075,611	1,461,100	1,827,017	2,112,675	35.8	25.0	15.6	96.4
5	Laredo	209,909	252,224	329,483	376,082	20.2	30.6	14.1	79.2
6	Houston	3,054,205	3,658,317	4,573,386	5,384,318	19.8	25.0	17.7	76.3
7	San Antonio	1,220,443	1,481,678	1,798,385	2,033,770	21.4	21.4	13.1	66.6
----	***State of Texas***	***14,229,191***	***16,986,510***	***20,851,820***	***23,507,783***	***19.4***	***22.8***	***12.7***	***65.2***
8	El Paso	500,350	615,196	704,318	761,231	23.0	14.5	8.1	52.1
9	Bryan	255,726	309,257	370,948	386,857	20.9	19.9	4.3	51.3
10	Tyler	444,472	514,932	593,394	640,570	15.9	15.2	8.0	44.1
11	Waco	470,303	533,086	624,850	659,070	13.3	17.2	5.5	40.1
12	Lufkin	219,119	244,135	284,315	298,618	11.4	16.5	5.0	36.3
13	Paris	269,404	290,641	337,130	359,394	7.9	16.0	6.6	33.4
14	Atlanta	262,021	279,632	303,557	312,829	6.7	8.6	3.1	19.4
15	Corpus Christi	474,055	496,841	549,025	562,050	4.8	10.5	2.4	18.6
16	Amarillo	314,824	319,913	350,605	363,803	1.6	9.6	3.8	15.6
17	Odessa	281,261	307,723	311,458	321,823	9.4	1.2	3.3	14.4
18	Yoakum	289,974	296,381	321,906	328,899	2.2	8.6	2.2	13.4
19	San Angelo	134,267	147,503	154,379	151,981	9.9	4.7	-1.6	13.2
20	Brownwood	116,940	117,191	126,210	129,422	0.2	7.7	2.5	10.7
21	Beaumont	501,381	495,357	552,822	554,044	-1.2	11.6	0.2	10.5
22	Wichita Falls	224,982	227,938	245,566	242,006	1.3	7.7	-1.4	7.6
23	Lubbock	420,300	413,263	429,458	436,534	-1.7	3.9	1.6	3.9
24	Abilene	238,914	242,391	252,753	246,310	1.5	4.3	-2.5	3.1
25	Childress	53,699	43,595	42,625	39,924	-18.8	-2.2	-6.3	-25.7

Source: Derived from U.S. Bureau of the Census. Population as of April 1 of the indicated year except 2006. Values for 2006 indicate population as of July 1, 2006 as estimated by the U.S. Bureau of the Census.

Table 1-4:
TxDOT Districts Ranked by Numerical Change in Total Population, 1980-2006

		Population				Numerical Change			
Rank	**District**	**1980**	**1990**	**2000**	**2006**	**1980-90**	**1990-00**	**2000-06**	**1980-06**
1	Houston	3,054,205	3,658,317	4,573,386	5,384,318	604,112	915,069	810,932	2,330,113
2	Dallas	1,992,701	2,593,288	3,414,427	3,980,040	600,587	821,139	565,613	1,987,339
3	Ft. Worth	1,075,611	1,461,100	1,827,017	2,112,675	385,489	365,917	285,658	1,037,064
4	Austin	645,846	919,988	1,349,581	1,627,982	274,142	429,593	278,401	982,136
5	San Antonio	1,220,443	1,481,678	1,798,385	2,033,770	261,235	316,707	235,385	813,327
6	Pharr	558,484	724,940	1,004,222	1,197,551	166,456	279,282	193,329	639,067
7	El Paso	500,350	615,196	704,318	761,231	114,846	89,122	56,913	260,881
8	Tyler	444,472	514,932	593,394	640,570	70,460	78,462	47,176	196,098
9	Waco	470,303	533,086	624,850	659,070	62,783	91,764	34,220	188,767
10	Laredo	209,909	252,224	329,483	376,082	42,315	77,259	46,599	166,173
11	Bryan	255,726	309,257	370,948	386,857	53,531	61,691	15,909	131,131
12	Paris	269,404	290,641	337,130	359,394	21,237	46,489	22,264	89,990
13	Corpus Christi	474,055	496,841	549,025	562,050	22,786	52,184	13,025	87,995
14	Lufkin	219,119	244,135	284,315	298,618	25,016	40,180	14,303	79,499
15	Beaumont	501,381	495,357	552,822	554,044	-6,024	57,465	1,222	52,663
16	Atlanta	262,021	279,632	303,557	312,829	17,611	23,925	9,272	50,808
17	Amarillo	314,824	319,913	350,605	363,803	5,089	30,692	13,198	48,979
18	Odessa	281,261	307,723	311,458	321,823	26,462	3,735	10,365	40,562
19	Yoakum	289,974	296,381	321,906	328,899	6,407	25,525	6,993	38,925
20	San Angelo	134,267	147,503	154,379	151,981	13,236	6,876	-2,398	17,714
21	Wichita Falls	224,982	227,938	245,566	242,006	2,956	17,628	-3,560	17,024
22	Lubbock	420,300	413,263	429,458	436,534	-7,037	16,195	7,076	16,234
23	Brownwood	116,940	117,191	126,210	129,422	251	9,019	3,212	12,482
24	Abilene	238,914	242,391	252,753	246,310	3,477	10,362	-6,443	7,396
25	Childress	53,699	43,595	42,625	39,924	-10,104	-970	-2,701	-13,775
	State of Texas	***14,229,191***	***16,986,510***	***20,851,820***	***23,507,783***	***2,757,319***	***3,865,310***	***2,655,963***	***9,278,592***

Source: Derived from U.S. Bureau of the Census. Population as of April 1 of the indicated year except 2006. Values for 2006 indicate population as of July 1, 2006 as estimated by the U.S. Bureau of the Census.

In 1920, the population of Texas was more evenly distributed throughout the State so that no district (as currently configured today) had more than ten percent of the total population. By 2006, 15.1 million people, or roughly 64.4 percent of the State's total population lived in the five largest districts of Austin, Dallas, Fort Worth, Houston, and San Antonio. This figure is the opposite of that found in 1920 when only 34.4 percent of the Texas population lived in these five districts (see Figure 1-2). In fact, not until 1970, were there more people living in these five districts than in all other districts combined.

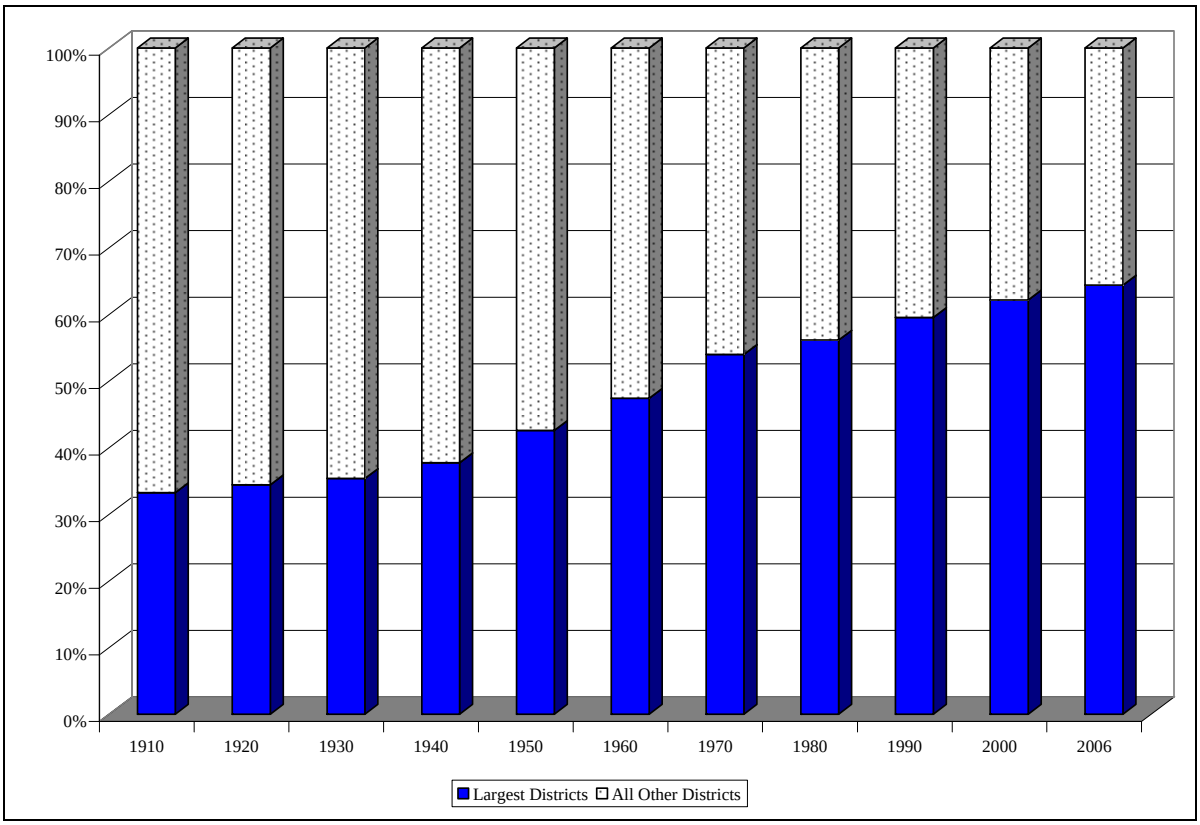

Figure 1-2: Proportion of Population in the Five Largest Districts and All Other Districts Combined, 1910-2006
Note: The five largest districts include Austin, Dallas, Fort Worth, Houston, and San Antonio.

Population Change by County

Not surprisingly, similar disparities in levels of population change can be seen at the county level – with population growth particularly pronounced along the Texas-Mexico border and in the area sometimes referred to as the "Texas Triangle" (see Figures 1-3 and 1-4). The Texas Triangle consists of the urban complexes of Houston, Dallas-Fort Worth, San Antonio, Austin and the areas in between – roughly following the Interstate 35, Interstate 10, and Interstate 45 corridors. In the Dallas-Fort Worth area the population increased by nearly 1.2 million in the 1990s (greater population growth than occurred in 45 of the 50 states). At the same time, population growth was roughly 957,000 in the Houston-Galveston area (greater than 40 of the 50 states) while the population in the Austin-San Antonio corridor grew by an additional 748,000 people (31 percent). Outside of these areas, population growth was evident primarily in metropolitan counties, while population losses were most evident in non-metropolitan (i.e. rural) counties. In the 1990s, 68 of Texas' 254 counties lost population. All of these counties were non-metropolitan. In the post-2000 period from 2000 to 2006 growth continued to concentrate in the state's large metropolitan complexes. Nearly all of the counties losing population between 2000 and 2006 (103) were non-metropolitan counties (U.S. Bureau of the Census 2007). In 1980, 81.1 percent of all Texans lived in metropolitan counties. After adding 8.7 million people between 1980 and 2006, the proportion metropolitan increased to 86 percent in 2006 (Table 1-5).

Metropolitan population growth can impact demand on the transportation system through the expansion of urban development into and beyond suburban areas. In order to understand metropolitan change within Texas, all 254 counties were categorized according to their metropolitan status and their proximity to metropolitan areas. The Office of Management and Budget (OMB) defines metropolitan statistical areas (MSAs). The counties that are included in MSAs change over time as areas meet certain thresholds as set forth by the OMB and as the criteria themselves change. Thus, in order to compare population change according to metropolitan status over time, we classified each county according to the 1993 OMB definitions for Metropolitan Statistical Areas for all time periods. Additionally, we classified counties according to their proximity to metropolitan counties. The counties are classified as one of four types: central city, suburban, non-metropolitan adjacent (to a central city or suburban county), and non-metropolitan non-adjacent. The twenty-seven central city counties are those where the central city of the metropolitan area is located (such as Dallas County). All other counties located in a MSA are considered suburban. Non-metropolitan counties are classified as either adjacent – those sharing a border with a metropolitan central city or suburban county – or non-adjacent.

According to these classifications, all county types experienced population growth between 1980 and 2006 (Table 1-5). However, the most rapid growth occurred in metropolitan counties – with the largest number of people added to metropolitan central city counties. Although the central city counties added more people between 1980 and 2006, suburban counties experienced the most rapid growth in percentage terms (Table 1-5). Between 1980 and 2006 suburban metropolitan counties increased by 160.2 percent. Indeed, suburban counties showed the most rapid growth in each time period since 1980 and their share of that growth has steadily increased. Between 2000 and 2006, 38.2 percent of net population change occurred in suburban counties, compared to just 29.7 percent during the 1990s. By 2006, an estimated 20.0 percent of all Texans lived in suburban counties (Table 1-5 and Figure 1-5). If the past is any indication of future changes, then the Texas population will become even more metropolitan and suburban areas will continue to experience rapid population growth.

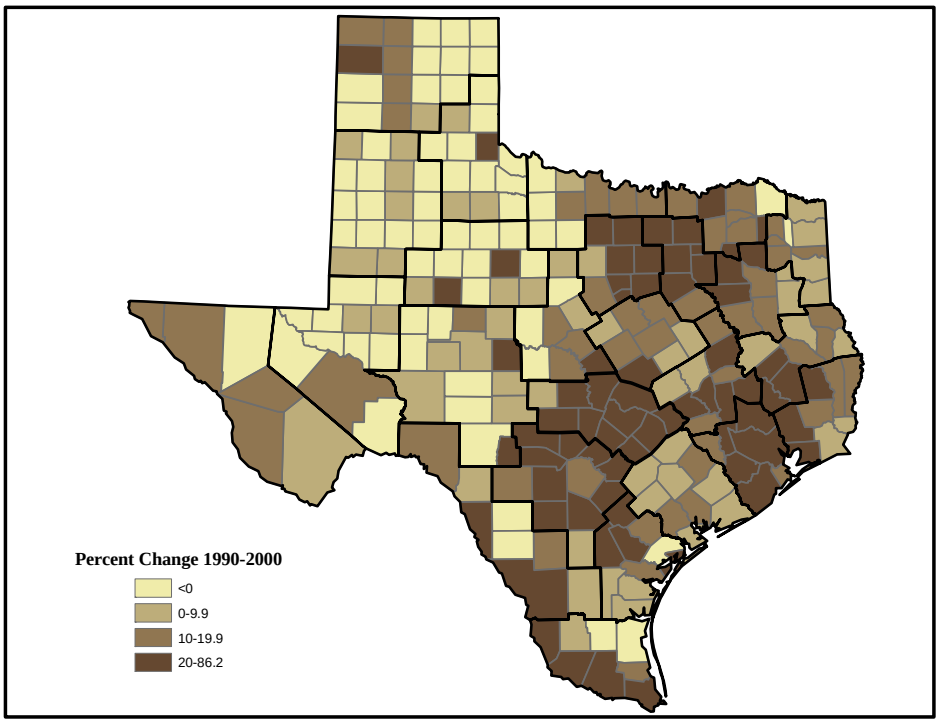

Figure 1-3: County Population Change, 1990-2000

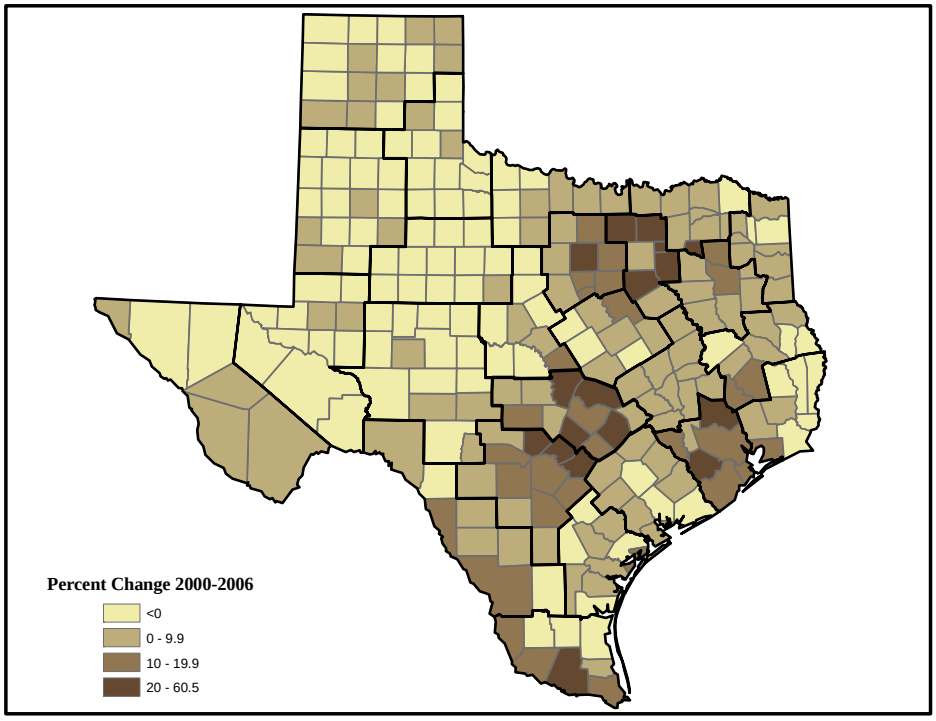

Figure 1-4: County Population Change, 2000-2006

Table 1-5:
Population, Population Change and Proportion of the Population by Metropolitan and Non-Metropolitan Status and Adjacency of County, 1980-2006

Area	Population				Numerical Change			Percent Change		
	1980	1990	2000	2006	1980-1990	1990-2000	2000-2006	1980-1990	1990-2000	2000-2006
Metropolitan Central City	9,731,481	11,615,291	13,993,705	15,517,964	1,883,810	2,378,414	1,524,259	19.4	20.5	10.9
Metropolitan Suburban	1,811,073	2,550,367	3,698,175	4,713,263	739,294	1,147,808	1,015,088	40.8	45.0	27.4
Nonmetropolitan Adjacent	1,841,723	1,962,353	2,234,027	2,335,355	120,630	271,674	101,328	6.5	13.8	4.5
Nonmetropolitan Nonadjacent	844,914	858,499	925,913	941,201	13,585	67,414	15,288	1.6	7.9	1.7
State of Texas	***14,229,191***	***16,986,510***	***20,851,820***	***23,507,783***	***2,757,319***	***3,865,310***	***2,655,963***	***19.4***	***22.8***	***12.7***

Area	Proportion of Population				Proportion of Net Change		
	1980	1990	2000	2006	1980-1990	1990-2000	2000-2006
Metropolitan Central City	68.4	68.4	67.1	66.0	68.3	61.5	57.4
Metropolitan Suburban	12.7	15.0	17.7	20.0	26.8	29.7	38.2
Nonmetropolitan Adjacent	12.9	11.6	10.7	9.9	4.4	7.0	3.8
Nonmetropolitan Nonadjacent	5.9	5.1	4.4	4.0	0.5	1.7	0.6
State of Texas	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Source: Derived from U.S. Bureau of the Census, Decennial Census counts for April 1 of year indicated except 2006. Population Estimates for July 1, 2006.

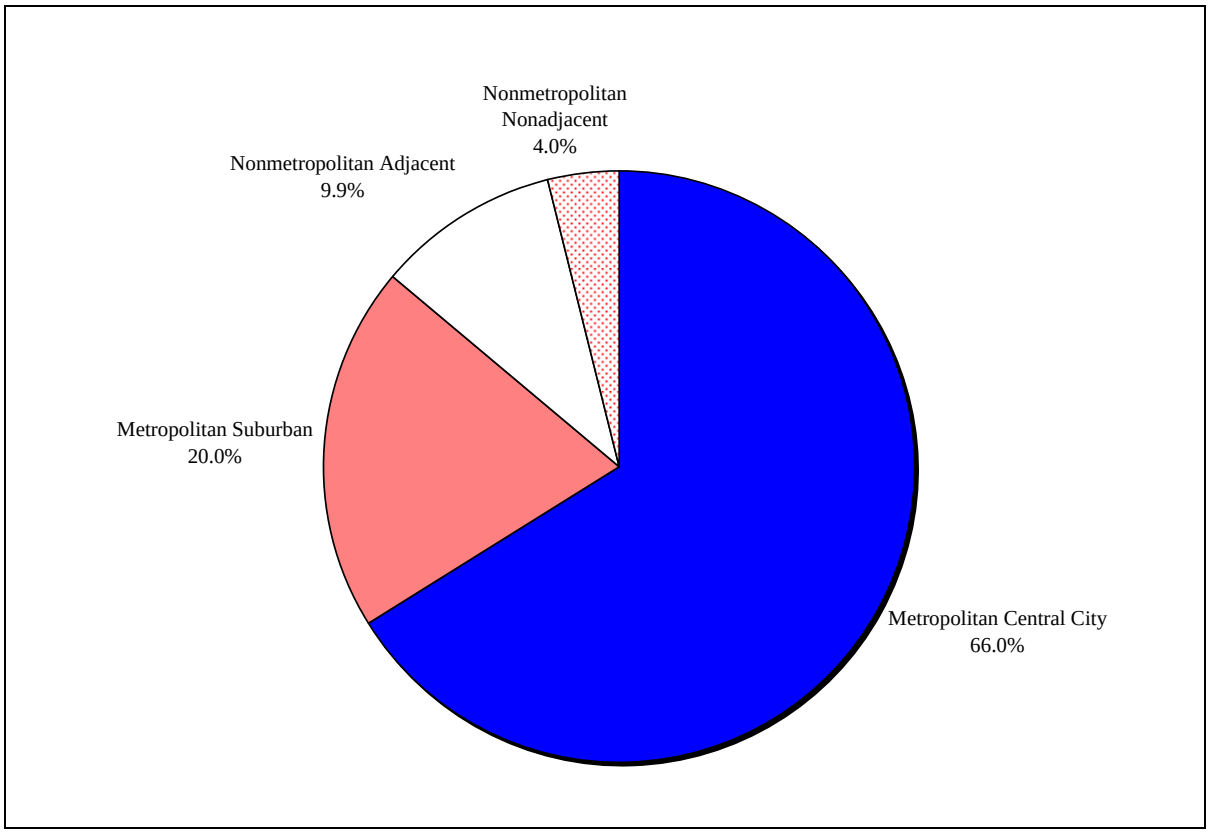

Figure 1-5: Population in Texas by Metropolitan and Non-Metropolitan County of Residence, 2006
Source: U.S. Bureau of the Census. MSA Categories based upon 1993 OMB Definitions.

Population Growth and Effects on Demand for TxDOT Services

In order to understand how future population change may impact Texas transportation system and TxDOT, we provide a summary of future population change using two alternative projection scenarios. These population projections were produced by the Office of the State Demographer and the Texas State Data Center in the Institute for Demographic and Socioeconomic Research at the University of Texas at San Antonio (Texas Population Estimates and Projections Program 2006). These projection scenarios utilize the widely accepted cohort-component population projection method (see Murdock and Ellis 1991, Smith et al. 2001). In this method, assumptions about the three major demographic processes – fertility, mortality, and migration – are developed for different population cohorts. The Texas State Data Center's population projections include population projections by individual years of age (<1-85+) and both sexes for four racial/ethnic groups (Anglo, Black, Hispanic, and Other). Information from the 2000 Census was used as a base to which the same set of birth and death rate assumptions and alternative scenarios of net migration by age, sex, and race/ethnicity were applied. Population projections are completed for each of the 254 Texas counties and the State as a whole, with the sum of county values for each age, sex, and race/ethnicity cohort being controlled to the State value. Additional information about this methodology and detailed population projection data can be accessed at the Texas State Data Center's Web site (http://txsdc.utsa.edu).

Although every effort was made in these projections to develop reasonable projections based upon accurate data and reasonable assumptions, there is a degree of uncertainty in these and any population or other type of projection. Population projections are less accurate for small population

areas, subgroups within the total population, and for longer periods of time (Murdock et al. 1987; Murdock and Ellis 1991; Siegel 2002; Smith et al. 2001). Typically, population projections for 5-10 years in the future will be more accurate than those produced for 30 or 40 years into the future. In recognition of these limitations and uncertainty, we explore the effects of population changes by utilizing two alternative population projection scenarios. Both of these scenarios share common assumptions about birth and death rates but they employ different assumptions about age-, sex-, and race/ethnicity-specific net migration. The first scenario (1.0 scenario) assumes that rates of net migration experienced during the 1990s will continue throughout the projection period (that is, the rates of net migration by age, sex, and race/ethnicity are assumed to be the same as, are 1.0 times, the 1990 to 2000 rates). The 1990s were a period of rapid growth for many counties in Texas. During the time period from 2000-2004 there were significant differences in migration patterns compared to those for the 1990s. Therefore, in a second scenario, we assume that the rates of age-, sex-, and race/ethnicity-specific net migration experienced between 2000 and 2004 continue throughout the projection period of 2000-2040 (00-04 scenario). Although two additional scenarios are prepared by the Texas State Data Center, we do not incorporate these in our analyses because one scenario assumes no in- or out- migration and is used primarily as a baseline for comparison to the other scenarios (0.0 scenario) and the second scenario is an alteration of the 1.0 scenario and assumes net migration rates one-half those of the 1.0 scenario. Because the 1990s were a period of rapid growth, we used the 1.0 scenario to highlight the effects of continued rapid growth throughout the planning period. The 1.0 scenario can therefore be considered a high-growth population projection scenario. We compare the effects of rapid growth similar to the 1990s with the moderate growth typified by the post 2000 period. Thus the 00-04 population projection scenario can be considered a moderate-growth scenario to which the effects of high growth can be compared. We utilize these projection scenarios in this and future chapters in order to explore the impacts of demographic changes on the Texas transportation system therefore partially taking into account the uncertainty inherent in projections.

Under either of these population projection scenarios, Texas' population will more than double between 2000 and 2040 (Figure 1-6). Assuming rates of net migration similar to those experienced during the 1990s (1.0 scenario), the State is projected to increase from 20.9 million people in 2000 to 51.7 million people by 2040 (a 148 percent increase). Under the more moderate scenario (00-04), the Texas population will increase to 43.6 million people in 2040 (a 109 percent increase). Much of this population growth will occur in the Texas Triangle and along the Texas-Mexico border (see Tables 1-6 through 1-11).

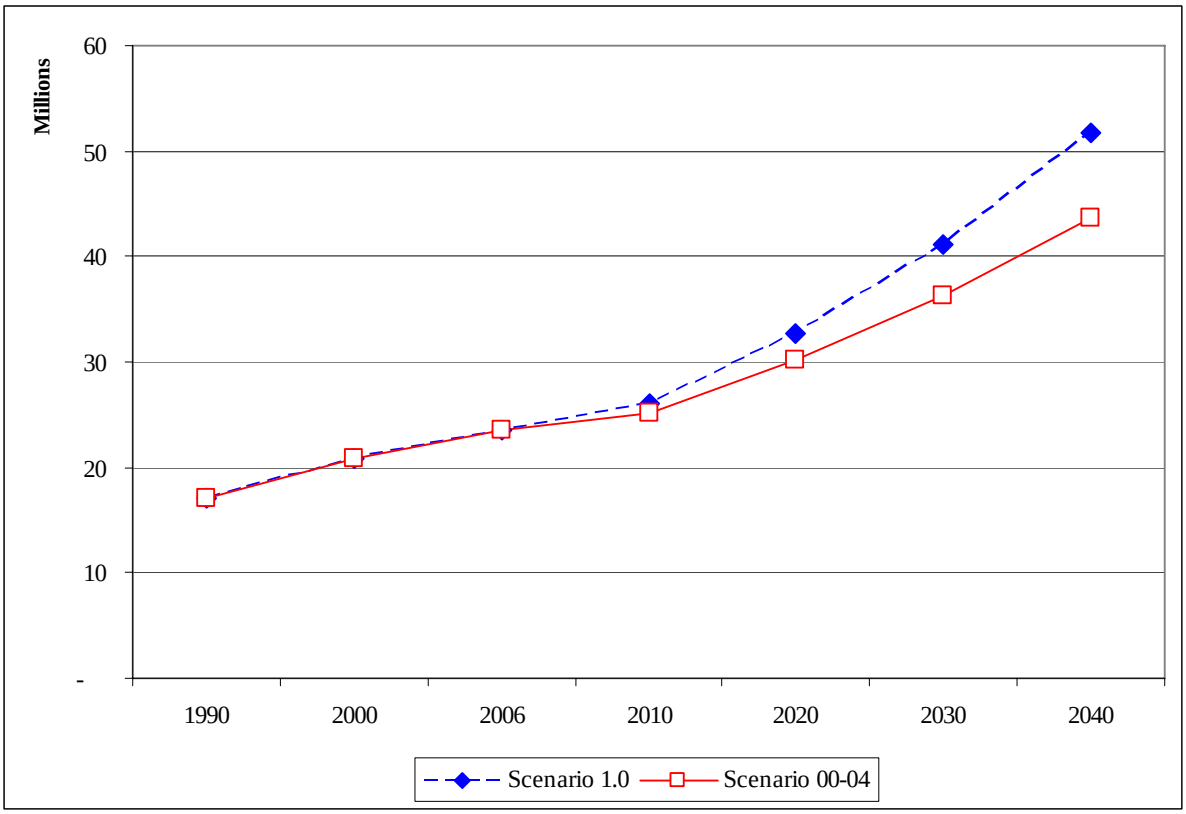

Figure 1-6: Population in Texas Using Alternative Population Projection Scenarios, 1990-2040

Under the 1.0 scenario, all but two TxDOT districts will add population between 2000 and 2040 and five districts will grow faster than the State as a whole. These five include the Texas Triangle districts of Dallas (268.3%), Austin (267.1%), Houston (173.7%), and Fort Worth (162.1%) as well as the Pharr district located on the Texas-Mexico border (173.7% increase). In 2000, six districts had a total population of at least 1 million and will continue to grow substantially. These districts, with their populations in 2000 and 2040 in parentheses, include: Austin (from 1.3 million to 5.0 million), Dallas (from 3.4 to 12.6 million), Ft. Worth (from 1.8 to 4.8 million), Houston (from 4.6 to 12.5 million), Pharr (from 1.0 to 2.8 million), and San Antonio (from 1.8 to 3.2 million). Three additional districts will have over 1 million people living within their border by 2040, including El Paso (at 1.3 million), Tyler (at 1.1 million), and Waco (at 1.2 million), compared to 704,000, 593,000, and 625,000 people, respectively, living in these districts in 2000. The districts with the lowest growth rates include more rural (non-metropolitan) counties and are located in West Central Texas or the Panhandle. Under this projection scenario, both the Abilene (at 248,000) and Childress (at 38,000) districts lose a little more than 4,000 people between 2000 and 2040 (from 253,000 and 43,000 people, respectively).

Under scenario 00-04, six districts will lose population between 2000 and 2040. These include Corpus Christi (-0.7%), Lubbock (-2.5%), Abilene (-11.7%), Wichita Falls (-13.1%), San Angelo (-16.5%) and Childress (-16.8%). Under this scenario, five districts will experience rates of growth larger than the State as a whole (148%). These include Dallas (207.0%), Austin (171.6%), Fort Worth (171.1%), Houston (136.6%), and Pharr (134.8%). Unlike in the previous scenario, only six districts will continue to include over 1 million people (compared to nine in the 1.0 scenario). These include Houston (10.8 million), Dallas (10.5 million), Fort Worth (5.0 million), Austin (3.7 million), San Antonio (2.8 million), and Pharr (2.4 million).

Table 1-6:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Using Projection Scenario 1.0 for TxDOT Districts

	Population		Change in Population	
District	**2000**	**2040**	**Numerical**	**Percent**
Abilene	252,753	248,409	-4,344	-1.7
Amarillo	350,605	549,806	199,201	56.8
Atlanta	303,557	394,514	90,957	30.0
Austin	1,349,581	4,954,246	3,604,665	267.1
Beaumont	552,822	927,001	374,179	67.7
Brownwood	114,314	143,170	28,856	25.2
Bryan	370,948	571,852	200,904	54.2
Childress	42,625	38,202	-4,423	-10.4
Corpus Christi	549,025	898,442	349,417	63.6
Dallas	3,414,427	12,575,109	9,160,682	268.3
El Paso	704,318	1,270,744	566,426	80.4
Fort Worth	1,827,017	4,788,026	2,961,009	162.1
Houston	4,573,386	12,516,511	7,943,125	173.7
Laredo	372,116	886,855	514,739	138.3
Lubbock	432,511	480,125	47,614	11.0
Lufkin	284,315	456,712	172,397	60.6
Odessa	311,458	372,318	60,860	19.5
Paris	303,340	570,629	267,289	88.1
Pharr	1,004,222	2,748,168	1,743,946	173.7
San Angelo	154,379	172,908	18,529	12.0
San Antonio	1,798,385	3,155,288	1,356,903	75.5
Tyler	593,394	1,083,591	490,197	82.6
Waco	624,850	1,191,411	566,561	90.7
Wichita Falls	245,566	283,619	38,053	15.5
Yoakum	321,906	429,844	107,938	33.5
State of Texas	***20,851,820***	***51,707,500***	***30,855,680***	***148.0***

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 1-7:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Using Projection Scenario 2000-2004 for TxDOT Districts

	Population		Change in Population	
District	**2000**	**2040**	**Numerical**	**Percent**
Abilene	252,753	223,071	-29,682	-11.7
Amarillo	350,605	402,511	51,906	14.8
Atlanta	303,557	326,603	23,046	7.6
Austin	1,349,581	3,665,365	2,315,784	171.6
Beaumont	552,822	704,223	151,401	27.4
Brownwood	114,314	145,417	31,103	27.2
Bryan	370,948	443,538	72,590	19.6
Childress	42,625	35,484	-7,141	-16.8
Corpus Christi	549,025	545,304	-3,721	-0.7
Dallas	3,414,427	10,481,951	7,067,524	207.0
El Paso	704,318	930,764	226,446	32.2
Fort Worth	1,827,017	4,952,327	3,125,310	171.1
Houston	4,573,386	10,822,349	6,248,963	136.6
Laredo	372,116	639,396	267,280	71.8
Lubbock	432,511	421,659	-10,852	-2.5
Lufkin	284,315	356,657	72,342	25.4
Odessa	311,458	367,329	55,871	17.9
Paris	303,340	482,236	178,896	59.0
Pharr	1,004,222	2,358,326	1,354,104	134.8
San Angelo	154,379	128,899	-25,480	-16.5
San Antonio	1,798,385	2,846,276	1,047,891	58.3
Tyler	593,394	956,539	363,145	61.2
Waco	624,850	765,995	141,145	22.6
Wichita Falls	245,566	213,308	-32,258	-13.1
Yoakum	321,906	366,401	44,495	13.8
State of Texas	***20,851,820***	***43,581,928***	***22,730,108***	***109.0***

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 1-8:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Under Projection Scenario 1.0 for TxDOT Districts, Ranked by Percent Population Change 2000-2040

		Population		Change in Population	
Rank	**District**	**2000**	**2040**	**Numerical**	**Percent**
1	Dallas	3,414,427	12,575,109	9,160,682	268.3
2	Austin	1,349,581	4,954,246	3,604,665	267.1
3	Houston	4,573,386	12,516,511	7,943,125	173.7
4	Pharr	1,004,222	2,748,168	1,743,946	173.7
5	Fort Worth	1,827,017	4,788,026	2,961,009	162.1
----	***State of Texas***	***20,851,820***	***51,707,500***	***30,855,680***	***148.0***
6	Laredo	372,116	886,855	514,739	138.3
7	Waco	624,850	1,191,411	566,561	90.7
8	Paris	303,340	570,629	267,289	88.1
9	Tyler	593,394	1,083,591	490,197	82.6
10	El Paso	704,318	1,270,744	566,426	80.4
11	San Antonio	1,798,385	3,155,288	1,356,903	75.5
12	Beaumont	552,822	927,001	374,179	67.7
13	Corpus Christi	549,025	898,442	349,417	63.6
14	Lufkin	284,315	456,712	172,397	60.6
15	Amarillo	350,605	549,806	199,201	56.8
16	Bryan	370,948	571,852	200,904	54.2
17	Yoakum	321,906	429,844	107,938	33.5
18	Atlanta	303,557	394,514	90,957	30.0
19	Brownwood	114,314	143,170	28,856	25.2
20	Odessa	311,458	372,318	60,860	19.5
21	Wichita Falls	245,566	283,619	38,053	15.5
22	San Angelo	154,379	172,908	18,529	12.0
23	Lubbock	432,511	480,125	47,614	11.0
24	Abilene	252,753	248,409	-4,344	-1.7
25	Childress	42,625	38,202	-4,423	-10.4

Source: U.S. Census Bureau; Texas State Data Center Estimates and Projections Program

Table 1-9:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Under Projection Scenario 00-04 for TxDOT Districts, Ranked by Percent Population Change 2000-2040

		Population		Change in Population	
Rank	**District**	**2000**	**2040**	**Numerical**	**Percent**
1	Dallas	3,414,427	10,481,951	7,067,524	207.0
2	Austin	1,349,581	3,665,365	2,315,784	171.6
3	Fort Worth	1,827,017	4,952,327	3,125,310	171.1
4	Houston	4,573,386	10,822,349	6,248,963	136.6
5	Pharr	1,004,222	2,358,326	1,354,104	134.8
----	***State of Texas***	***20,851,820***	***43,581,928***	***22,730,108***	***109.0***
6	Laredo	372,116	639,396	267,280	71.8
7	Tyler	593,394	956,539	363,145	61.2
8	Paris	303,340	482,236	178,896	59.0
9	San Antonio	1,798,385	2,846,276	1,047,891	58.3
10	El Paso	704,318	930,764	226,446	32.2
11	Beaumont	552,822	704,223	151,401	27.4
12	Brownwood	114,314	145,417	31,103	27.2
13	Lufkin	284,315	356,657	72,342	25.4
14	Waco	624,850	765,995	141,145	22.6
15	Bryan	370,948	443,538	72,590	19.6
16	Odessa	311,458	367,329	55,871	17.9
17	Amarillo	350,605	402,511	51,906	14.8
18	Yoakum	321,906	366,401	44,495	13.8
19	Atlanta	303,557	326,603	23,046	7.6
20	Corpus Christi	549,025	545,304	-3,721	-0.7
21	Lubbock	432,511	421,659	-10,852	-2.5
22	Abilene	252,753	223,071	-29,682	-11.7
23	Wichita Falls	245,566	213,308	-32,258	-13.1
24	San Angelo	154,379	128,899	-25,480	-16.5
25	Childress	42,625	35,484	-7,141	-16.8

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 1-10:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Under Projection Scenario 1.0 for TxDOT Districts, Ranked by Numerical Population Change 2000-2040

		Population		Change in Population	
Rank	**District**	**2000**	**2040**	**Numerical**	**Percent**
1	Dallas	3,414,427	12,575,109	9,160,682	268.3
2	Houston	4,573,386	12,516,511	7,943,125	173.7
3	Austin	1,349,581	4,954,246	3,604,665	267.1
4	Fort Worth	1,827,017	4,788,026	2,961,009	162.1
5	Pharr	1,004,222	2,748,168	1,743,946	173.7
6	San Antonio	1,798,385	3,155,288	1,356,903	75.5
7	Waco	624,850	1,191,411	566,561	90.7
8	El Paso	704,318	1,270,744	566,426	80.4
9	Laredo	372,116	886,855	514,739	138.3
10	Tyler	593,394	1,083,591	490,197	82.6
11	Beaumont	552,822	927,001	374,179	67.7
12	Corpus Christi	549,025	898,442	349,417	63.6
13	Paris	303,340	570,629	267,289	88.1
14	Bryan	370,948	571,852	200,904	54.2
15	Amarillo	350,605	549,806	199,201	56.8
16	Lufkin	284,315	456,712	172,397	60.6
17	Yoakum	321,906	429,844	107,938	33.5
18	Atlanta	303,557	394,514	90,957	30.0
19	Odessa	311,458	372,318	60,860	19.5
20	Lubbock	432,511	480,125	47,614	11.0
21	Wichita Falls	245,566	283,619	38,053	15.5
22	Brownwood	114,314	143,170	28,856	25.2
23	San Angelo	154,379	172,908	18,529	12.0
24	Abilene	252,753	248,409	-4,344	-1.7
25	Childress	42,625	38,202	-4,423	-10.4
	State of Texas	***20,851,820***	***51,707,500***	***30,855,680***	***148.0***

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 1-11:
Total Population in 2000 and Projected Total Population in 2040, and Numerical and Percent Change in Population, 2000-2040, Using Projection Scenario 00-04 for TxDOT Districts, Ranked by Numerical Population Change 2000-2040

		Population		Change in Population	
Rank	**District**	**2000**	**2040**	**Numerical**	**Percent**
1	Dallas	3,414,427	10,481,951	7,067,524	207.0
2	Houston	4,573,386	10,822,349	6,248,963	136.6
3	Fort Worth	1,827,017	4,952,327	3,125,310	171.1
4	Austin	1,349,581	3,665,365	2,315,784	171.6
5	Pharr	1,004,222	2,358,326	1,354,104	134.8
6	San Antonio	1,798,385	2,846,276	1,047,891	58.3
7	Tyler	593,394	956,539	363,145	61.2
8	Laredo	372,116	639,396	267,280	71.8
9	El Paso	704,318	930,764	226,446	32.2
10	Paris	303,340	482,236	178,896	59.0
11	Beaumont	552,822	704,223	151,401	27.4
12	Waco	624,850	765,995	141,145	22.6
13	Bryan	370,948	443,538	72,590	19.6
14	Lufkin	284,315	356,657	72,342	25.4
15	Odessa	311,458	367,329	55,871	17.9
16	Amarillo	350,605	402,511	51,906	14.8
17	Yoakum	321,906	366,401	44,495	13.8
18	Brownwood	114,314	145,417	31,103	27.2
19	Atlanta	303,557	326,603	23,046	7.6
20	Corpus Christi	549,025	545,304	-3,721	-0.7
21	Childress	42,625	35,484	-7,141	-16.8
22	Lubbock	432,511	421,659	-10,852	-2.5
23	San Angelo	154,379	128,899	-25,480	-16.5
24	Abilene	252,753	223,071	-29,682	-11.7
25	Wichita Falls	245,566	213,308	-32,258	-13.1
	State of Texas	***20,851,820***	***43,581,928***	***22,730,108***	***109.0***

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

In 2006, 15.1 million people or 64.4 percent of Texas' population lived in the five largest districts of Austin, Dallas, Fort Worth, Houston, and San Antonio. Under both projection scenarios, over 70 percent of Texas' population will reside in these same five districts by 2040. Under the 1.0 scenario, 73.5% or 38.0 million people will live in these districts. However, if net migration rates continue as they have in the post 2000 period, then 75.2% or 32.8 million people will live in these largest TxDOT districts by 2040 (see Figure 1-7).

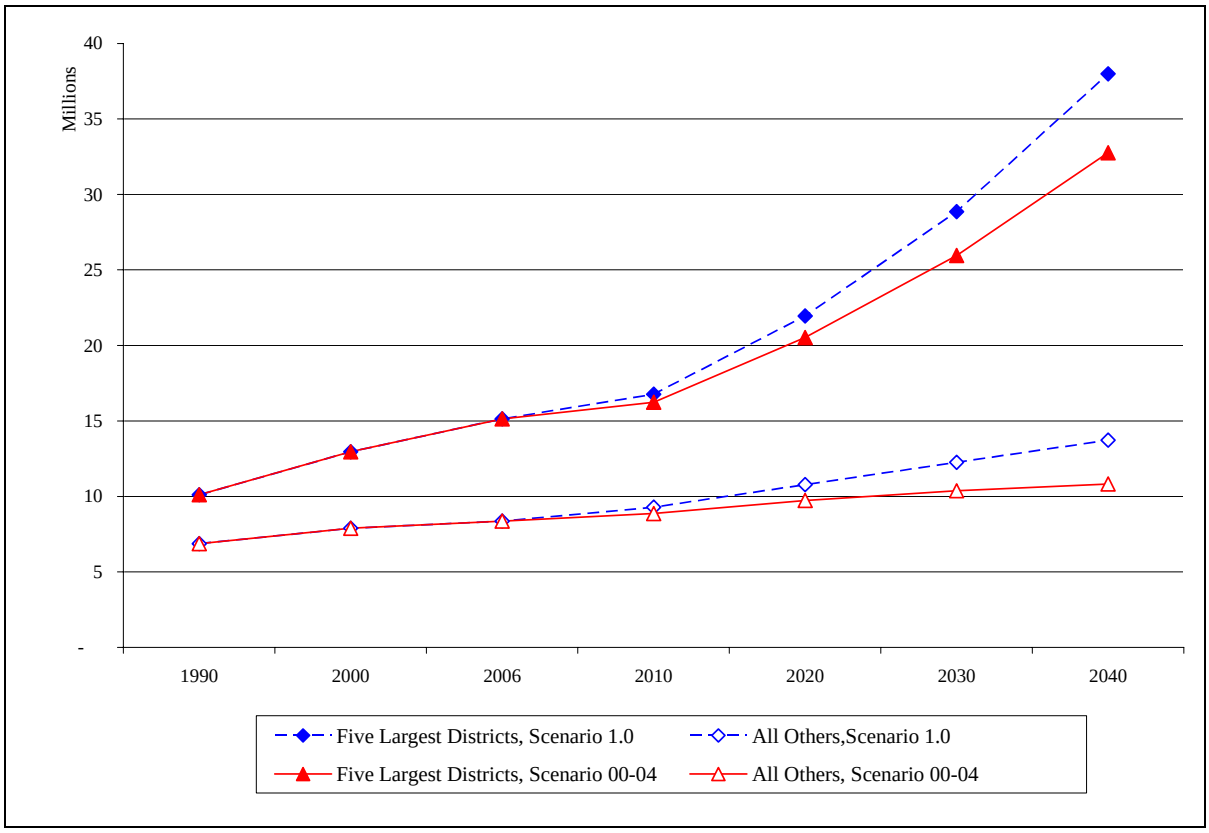

Figure 1-7: Population Change by the Five Largest Districts and All Other Districts Combined, 1990-2040 by Projection Scenarios

Under either projection scenario, the proportion of Texas' population living in non-metropolitan areas will decrease to less than ten percent although the population of all types of counties will expand over time. The population will continue to concentrate primarily in metropolitan areas, with the largest percentage increases occurring in suburban metropolitan counties (Table 1-12). Suburban population growth will have a significant impact on the future of the Texas transportation system regardless of the projection scenario utilized. Both population scenarios indicate that suburban counties will more than triple their populations between 2000 and 2040 (Table 1-12). In fact, under the 00-04 scenario, the numerical change in suburban counties will surpass the growth of metropolitan central city counties. Rapid growth in suburban areas will continue to effect changes in quality of life factors – including those directly or indirectly related to the transportation system such as traffic congestion and air quality.

Table 1-12:
Total Population Change and Percent Population Change by Metropolitan and Non-Metropolitan Status of County, 2000-2040 by Alternative Projection Scenarios

	Population			Numerical Change		Percent Change	
		2040		2000-2040		2000-2040	
Area	2000	Scenario 1.0	Scenario 00-04	Scenario 1.0	Scenario 00-04	Scenario 1.0	Scenario 00-04
Metropolitan Central City	13,993,705	30,942,735	24,162,684	16,949,030	10,168,979	121.1	72.7
Metropolitan Suburban	3,698,175	16,156,048	15,696,157	12,457,873	11,997,982	336.9	324.4
Nonmetropolitan Adjacent	2,234,027	3,496,214	2,737,373	1,262,187	503,346	56.5	22.5
Nonmetropolitan Nonadjacent	925,913	1,112,503	985,714	186,590	59,801	20.2	6.5
State of Texas	***20,851,820***	***51,707,500***	***43,581,928***	***30,855,680***	***22,730,108***	***148.0***	***109.0***

	Proportion of Population			Proportion of Net Change	
		2040		2000-2040	
Area	2000	Scenario 1.0	Scenario 00-04	Scenario 1.0	Scenario 00-04
Metropolitan Central City	67.1	59.8	55.4	54.9	44.7
Metropolitan Suburban	17.7	31.2	36.0	40.4	52.8
Nonmetropolitan Adjacent	10.7	6.8	6.3	4.1	2.2
Nonmetropolitan Nonadjacent	4.4	2.2	2.3	0.6	0.3
State of Texas	***100.0***	***100.0***	***100.0***	***100.0***	***100.0***

Source: U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Conclusion

The demographic character of Texas has changed significantly since 1917, when the Texas Department of Transportation was first organized. At that time, the highway department served the transportation needs of a population that was more evenly distributed throughout the twenty-five TxDOT districts (as currently configured) and a population that was more rural oriented than today. After years of sustained population growth, the population of Texas in 2006 was five times the size it was in 1917. Population projections anticipate continued population growth into the near- and long-term future. In this chapter, we have provided an overview of total population change for the State, TxDOT districts, and by metropolitan location of county. The data in this chapter point to significant change in the Texas population with implications for Texas' transportation and the Texas Department of Transportation. These include:

1. ***Rapid population growth.*** Under either of the population projection scenarios examined, the Texas' population will more than double by 2040. This will require a sustained commitment on the part of TxDOT and related agencies to meet the transportation infrastructure needs of this rapidly growing state.

2. ***Texas triangle and border population growth.*** Although many counties within the State have experienced population growth over past decades, the most rapid and concentrated growth has, and will continue to occur, among only a few corridors – mainly the Texas Triangle area of Austin-San Antonio, Dallas-Fort Worth, and Houston and the South Texas border area. By 2040, over seventy percent of the population will live in five TxDOT districts, including: Austin, Dallas, Fort Worth, Houston, and San Antonio. Conflicts could arise in trying to meet the needs of these more populated TxDOT districts while at the same time maintaining adequate levels of service in all areas. Thus, changes in population may require shifts in how resources are allocated and services are provided.

3. ***Concentration of people in metropolitan areas.*** Similarly, regardless of location in the State, the counties that were most likely to grow in the past were located in metropolitan areas. Thus, transportation issues related to metropolitan areas will continue to play a significant role in formulating transportation policy. These include such issues as congestion management, public transportation planning and development, and air quality mitigation.

4. ***Rapid suburbanization.*** Related to metropolitan growth is the issue of suburbanization. Despite redevelopment of downtown areas, the most significant population growth has and is projected to continue to occur in suburban counties. Indeed, under one of the projection scenarios, more people will be added in suburban counties than central city counties between 2000 and 2040. There will be a significant need for additional infrastructure in order to meet the needs of this growing population.

Clearly, such changes may have substantial impacts on TxDOT. The rapid growth in the State has strained the existing transportation network and resulted in the need for extensive expansions to the system in virtually every major city in Texas. In slower growing rural areas the need for roadway maintenance is high at a time when the sources of revenue are either declining or relatively stagnant. Funding for either expansion or maintenance projects has often been insufficient and a variety of new forms of funding are being considered, but seldom has the long-term funding required for such projects been evaluated relative to the future socioeconomic characteristics of the population. Similarly, system preferences have often not been evaluated relative to key population segments (e.g., by race/ethnicity, age, economic status) so that it is not clear whether what is preferred and supported

now will be in the future. In the following chapter, we provide an overview of compositional changes in the Texas population and their potential impacts on TxDOT and the Texas transportation system. In subsequent chapters we delineate the effects of changes in the size and characteristics of the population on areas of importance and concern to TxDOT.

Chapter 2

Current and Future Change in the Characteristics of the Texas Population and Texas Households

Introduction

In addition to total population change and distribution, many of the characteristics of Texas' population are changing rapidly and will also substantially impact transportation. Although there are a large number of such characteristics that could be considered, changes in the racial/ethnic composition of Texas, changes in the age structure, and changes in the number, size and types of households are particularly important. They are important because they affect transportation in both direct and indirect ways. First, these factors affect the number of users of transportation services because of differences in transportation use patterns by age, race/ethnicity, and household type. Secondly, and equally important, they affect the resources that populations have to utilize different forms of transportation. This latter affect is evident when simple income differentials by such characteristics are examined. Thus Table 2-1 shows that incomes are higher for middle aged persons than for younger persons, for Anglos than for persons in the other racial/ethnic categories, and for family, especially married-couple families, than for non family households and single-parent families. Even more startling, Murdock et al. (2003) suggest that in the absence of change in the socioeconomic differentials among racial/ethnic, age and household groups, future demographic change could also substantially alter the socioeconomic characteristics of Texas' population such that the work force could be less well educated by 2040 than in 2000, median household income in 2040 could be $6,500 less in 2000 constant dollars than in 2000, and the percentage of family households in poverty could increase by roughly four percent compared to that in 2000. Changes in population characteristics may clearly affect the resources available to spend on services, including transportation.

In this chapter we provide an overview of changes in the composition of Texas population as a whole and for districts of the Texas Department of Transportation (TxDOT) through 2040. We first present changes in race and ethnicity followed by changes in the age characteristics of the population, and then by changes in the number, size and types of households. As in Chapter 1, we use population projections (and related projections of households and households by type) prepared by the Texas State Data Center and the Office of the State Demographer in 2006 – emphasizing the projection scenario which assumes similar patterns of net migration to those evident in the State in the 1990s and the scenario that assumes patterns of net migration which occurred in the early 2000s. We conclude with a discussion of the possible implications of these changes for transportation in Texas and for the Texas Department of Transportation.

Table 2-1:
Median Household Income by
Householder Characteristics, 2000

Characteristics of Householder	Median Income
Age of Householder	
Total	$ 39,927
<25	21,570
25-34	37,732
35-44	47,418
45-54	52,926
55-64	44,905
65-74	30,296
75+	21,734
Race/Ethnicity of Householder	
Total	$ 39,927
Anglo	47,162
Black	29,305
Hispanic	29,873
Other	44,834
Household Type	
All households	$ 39,927
Family households	45,861
Married couple	53,338
Female householder	23,583
Male householder	31,739
Nonfamily households	25,623

Source: U.S. Bureau of the Census, Census 2000 Summary File 3, [machine readable data files], 2002.

Race and Ethnicity

Texas' population in 1980 was roughly two-thirds Anglo but, by 2000, it was 53 percent Anglo and the Census Bureau's estimates program indicated that by 2004 Texas was a State with no majority racial/ethnic group. By 2005, Texas' population was approximately 49.2 percent Anglo, 11.2 percent Black or African-American, 35.1 percent Hispanic, and 4.5 percent were members of Other racial/ethnic groups (primarily Asian) (see Table 2-2). Such changes in the racial/ethnic characteristics of the State's population alter social and cultural patterns but may have particularly pronounced effects on all services and planning processes including transportation and transportation planning because of differentials in economic resources. Due to a variety of historical, discriminatory, and other factors, African-American and Hispanic populations in Texas had median household income levels in 1999 that were less than two-thirds of those for Anglos, whereas poverty levels for African-Americans and Hispanics were nearly three times as high as those for Anglos. Educational gaps also remain substantial with the percent of adults (25 years of age or older) with a college degree in 2000 being roughly 30 percent for Anglos, 15 percent for African-Americans, and 9 percent for Hispanics. These characteristics directly influence transportation utilization and as a result, rates of vehicle ownership, public transportation utilization, carpooling, and average vehicle miles of travel. These, among other things, are generally lower for persons of all other race/ethnicities than they are for Anglos (Bureau of Transportation Statistics 2004; U.S. Bureau of the Census 2004; Pucher and Renne 2003).

Table 2-2:
Population and Percent Population Change in Texas by Race/Ethnicity, 2000-2005

	Population				2000-2005 Change	
Race/Ethnicity	**2000**	**%**	**2005**	**%**	**Numerical**	**Percent**
Anglo	11,074,716	53.1	11,242,510	49.2	255,545	2.3
Black	2,421,653	11.6	2,569,946	11.2	191,502	8.1
Hispanic	6,669,666	32.0	8,029,844	35.1	1,360,178	20.4
Other	685,785	3.3	1,017,668	4.5	200,923	24.6
Total	20,851,820	100.0	22,859,968	100.0	2,008,148	9.6

Source: U.S. Bureau of the Census; Texas State Data Center Population Estimates and Projections Program.

Recent estimates by both the Texas State Data Center and the Census Bureau show transitions of the Texas population from an Anglo majority to a non-Anglo majority. This diversity will continue into the future, with the most rapid growth occurring in the Hispanic population (Tables 2-2 through 2-4). According to the Texas State Data Center's two projection scenarios that most closely reflect recent patterns of population change (those assuming the 2000-2004 and 1990-2000 rates of net migration, respectively), Texas' population would be between 43 and 52 million people in 2040 (40- year growth rates of 109 to 148 percent) and would be between 24 and 26 percent Anglo, about 8 percent African-American, between 58 and 59 percent Hispanic, and between 8 and 9 percent would be members of Other racial/ethnic groups, primarily Asian. The majority of Texas' population is projected to be Hispanic by 2030. Between 2000 and 2040, the Anglo population increases by 11.8 percent under scenario 1.0 and will be less then one-fourth of the total population in 2040. Under this scenario, the Hispanic and Other population groups will grow to over three times the size they were in 2000. During the early 2000s, the population grew slower than it did during the 1990s primarily due to a decline in domestic migration to Texas. This trend had the most significant impacts on the Anglo population as the scenario that utilizes post-2000 patterns of age, sex, and race/ethnicity specific net migration (00-04), shows a 1.6 percent decline in the Anglo population between 2000 and 2040.

Table 2-3:
Population in Texas by Race/Ethnicity in 2000 and Projections to 2040
Assuming Alternative Projection Scenarios

	Total Population				
Year	**Anglo**	**Black**	**Hispanic**	**Other**	**Total**
2000	11,074,716	2,421,653	6,669,666	685,785	20,851,820
	Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)				
2010	11,739,988	2,888,448	10,252,220	1,177,909	26,058,565
2020	12,227,547	3,361,700	15,226,387	1,921,059	32,736,693
2030	12,442,107	3,783,673	21,871,386	3,020,458	41,117,624
2040	12,376,308	4,140,673	30,604,622	4,585,897	51,707,500
	Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)				
2010	11,369,946	2,778,528	9,827,743	1,129,429	25,105,646
2020	11,461,192	3,106,273	13,922,261	1,762,813	30,252,539
2030	11,299,159	3,355,344	19,032,000	2,646,377	36,332,880
2040	10,899,933	3,523,778	25,325,641	3,832,576	43,581,928

	Percent Change				
Year	**Anglo**	**Black**	**Hispanic**	**Other**	**Total**
	Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)				
2000-2010	6.0	19.3	53.7	71.8	25.0
2010-2020	4.2	16.4	48.5	63.1	25.6
2020-2030	1.8	12.6	43.6	57.2	25.6
2030-2040	-0.5	9.4	39.9	51.8	25.8
2000-2040	11.8	71.0	358.9	568.7	148.0
	Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)				
2000-2010	2.7	14.7	47.3	64.7	20.4
2010-2020	0.8	11.8	41.7	56.1	20.5
2020-2030	-1.4	8.0	36.7	50.1	20.1
2030-2040	-3.5	5.0	33.1	44.8	20.0
2000-2040	-1.6	45.5	279.7	458.9	109.0

Source: Texas State Data Center Population Estimates and Projections Program.

Table 2-4:
Percent Population by Race/Ethnicity in Texas
Assuming Alternative Projection Scenarios, 2000-2040

Year	Percent of Total Population				
	Anglo	Black	Hispanic	Other	Total
2000	53.1	11.6	32.0	3.3	100.0
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)					
2010	45.1	11.1	39.3	4.5	100.0
2020	37.3	10.3	46.5	5.9	100.0
2030	30.3	9.2	53.2	7.3	100.0
2040	23.9	8.0	59.2	8.9	100.0
Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)					
2010	45.3	11.1	39.1	4.5	100.0
2020	37.9	10.3	46.0	5.8	100.0
2030	31.1	9.2	52.4	7.3	100.0
2040	25.0	8.1	58.1	8.8	100.0

Source: Texas State Data Center Population Estimates and Projections Program.

As shown in Tables 2-5 through 2-7, all districts will become more racially/ethnically diverse under both projection scenarios. In 2005, the majority of the populations in only six districts consisted of people of race/ethnicities other than Anglo (Corpus Christi, El Paso, Laredo, Odessa, Pharr, and San Antonio – Table 2-5). Under both population projections scenarios, all districts will see increases in the number of people of race/ethnicities other than Anglo. Under the assumption that the 1990s rates of net migration continue through 2040 (scenario 1.0), there will be increases in the Anglo population in only the Austin, Bryan, Dallas, Lufkin, Paris, and San Antonio districts (Table 2-6). And because there are significant differences in the rates of net migration during the post 2000 period, the 2000-2004 migration projection scenario (00-04), shows increases in the Anglo population in the Austin and Dallas districts only (Table 2-7). Today, Hispanic majorities can be found in only the districts along the Texas-Mexico border. But by 2040, even the majorities of the populations in districts as distant from the border as Amarillo and Dallas will be Hispanic. In fact, under both projection scenarios, the majority of the populations in 13 of the 25 districts will be Hispanic. Like the Hispanic population, both the Black and Other (primarily Asian) populations will grow in all areas of the State – but will continue to concentrate primarily in the Dallas and Houston districts, with both districts adding over 1 million people (combined) from these two race/ethnicity groups.

Table 2-5:
Estimated Population and Percent Population by Race/Ethnicity in 2005 for TxDOT Districts

	Anglo		Black		Hispanic		Other		Total	
District	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Abilene	170,977	67.9	16,791	6.7	60,042	23.8	4,043	1.6	251,853	100.0
Amarillo	241,800	67.1	16,946	4.7	93,405	25.9	8,226	2.3	360,377	100.0
Atlanta	219,611	70.4	63,048	20.2	26,444	8.5	2,954	0.9	312,057	100.0
Austin	940,119	59.9	115,187	7.3	447,694	28.5	67,095	4.3	1,570,095	100.0
Beaumont	369,303	65.8	121,757	21.7	56,512	10.1	13,978	2.5	561,550	100.0
Brownwood	100,908	78.5	3,567	2.8	23,051	17.9	991	0.8	128,517	100.0
Bryan	251,641	64.6	60,889	15.6	66,841	17.2	10,068	2.6	389,439	100.0
Childress	29,408	71.6	2,977	7.2	8,368	20.4	341	0.8	41,094	100.0
Corpus Christi	205,939	36.9	22,542	4.0	319,286	57.3	9,887	1.8	557,654	100.0
Dallas	2,001,839	52.0	566,307	14.7	1,063,630	27.6	215,006	5.6	3,846,782	100.0
El Paso	110,040	14.6	20,218	2.7	608,868	81.0	12,799	1.7	751,925	100.0
Fort Worth	1,275,526	62.2	226,712	11.0	453,738	22.1	95,964	4.7	2,051,940	100.0
Houston	2,198,836	43.0	839,438	16.4	1,741,996	34.1	334,070	6.5	5,114,340	100.0
Laredo	27,642	7.5	1,456	0.4	338,725	91.3	3,026	0.8	370,849	100.0
Lubbock	236,661	54.6	27,517	6.4	162,553	37.5	6,520	1.5	433,251	100.0
Lufkin	209,186	70.5	48,086	16.2	36,143	12.2	3,262	1.1	296,677	100.0
Odessa	155,263	49.3	16,313	5.2	138,723	44.1	4,324	1.4	314,623	100.0
Paris	288,684	81.0	31,999	9.0	29,751	8.3	6,127	1.7	356,561	100.0
Pharr	113,281	9.7	3,664	0.3	1,038,996	89.2	8,795	0.8	1,164,736	100.0
San Angelo	91,943	60.3	4,895	3.2	53,678	35.2	2,041	1.3	152,557	100.0
San Antonio	777,945	39.4	118,959	6.0	1,029,900	52.2	45,586	2.3	1,972,390	100.0
Tyler	443,363	70.8	98,102	15.7	77,555	12.4	7,107	1.1	626,127	100.0
Waco	391,479	59.3	121,885	18.5	126,170	19.1	20,309	3.1	659,843	100.0
Wichita Falls	190,038	77.6	17,148	7.0	31,845	13.0	5,905	2.4	244,936	100.0
Yoakum	186,818	56.6	31,022	9.4	107,695	32.7	4,260	1.3	329,795	100.0
State of Texas	***11,228,250***	***49.1***	***2,597,425***	***11.4***	***8,141,609***	***35.6***	***892,684***	***3.9***	***22,859,968***	***100.0***

Source: Texas State Data Center Population Estimates and Projections Program

Table 2-6:
Projected Population and Percent Population by Race/Ethnicity in 2040 for TxDOT Districts (Scenario 1.0)

	Anglo		Black		Hispanic		Other		Total	
District	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Abilene	112,576	45.3	22,226	8.9	98,098	39.5	15,509	6.2	248,409	100.0
Amarillo	200,271	36.4	24,286	4.4	297,247	54.1	28,002	5.1	549,806	100.0
Atlanta	177,027	44.9	69,181	17.5	142,366	36.1	5,940	1.5	394,514	100.0
Austin	1,842,342	37.2	273,398	5.5	2,468,353	49.8	370,153	7.5	4,954,246	100.0
Beaumont	339,322	36.6	153,466	16.6	373,212	40.3	61,001	6.6	927,001	100.0
Brownwood	89,760	62.7	3,942	2.8	48,369	33.8	1,099	0.8	143,170	100.0
Bryan	274,692	48.0	76,656	13.4	193,013	33.8	27,491	4.8	571,852	100.0
Childress	20,751	54.3	3,323	8.7	13,776	36.1	352	0.9	38,202	100.0
Corpus Christi	172,495	19.2	30,706	3.4	648,532	72.2	46,709	5.2	898,442	100.0
Dallas	3,275,947	26.1	1,157,137	9.2	6,929,147	55.1	1,212,878	9.6	12,575,109	100.0
El Paso	37,703	3.0	18,985	1.5	1,168,900	92.0	45,156	3.6	1,270,744	100.0
Fort Worth	1,099,826	23.0	401,795	8.4	2,730,734	57.0	555,671	11.6	4,788,026	100.0
Houston	1,906,630	15.2	1,186,655	9.5	7,778,957	62.1	1,644,269	13.1	12,516,511	100.0
Laredo	22,939	2.6	1,461	0.2	851,045	96.0	11,410	1.3	886,855	100.0
Lubbock	150,379	31.3	33,458	7.0	277,130	57.7	19,158	4.0	480,125	100.0
Lufkin	222,227	48.7	56,237	12.3	166,312	36.4	11,936	2.6	456,712	100.0
Odessa	72,196	19.4	16,678	4.5	270,177	72.6	13,267	3.6	372,318	100.0
Paris	291,154	51.0	50,601	8.9	201,427	35.3	27,447	4.8	570,629	100.0
Pharr	78,499	2.9	4,237	0.2	2,610,676	95.0	54,756	2.0	2,748,168	100.0
San Angelo	61,095	35.3	5,325	3.1	100,053	57.9	6,435	3.7	172,908	100.0
San Antonio	881,523	27.9	164,918	5.2	1,849,944	58.6	258,903	8.2	3,155,288	100.0
Tyler	427,845	39.5	102,824	9.5	522,437	48.2	30,485	2.8	1,083,591	100.0
Waco	335,080	28.1	224,809	18.9	526,805	44.2	104,717	8.8	1,191,411	100.0
Wichita Falls	143,905	50.7	22,203	7.8	97,388	34.3	20,123	7.1	283,619	100.0
Yoakum	140,124	32.6	36,166	8.4	240,524	56.0	13,030	3.0	429,844	100.0
State of Texas	***12,376,308***	***23.9***	***4,140,673***	***8.0***	***30,604,622***	***59.2***	***4,585,897***	***8.9***	***51,707,500***	***100.0***

Source: Texas State Data Center Population Estimates and Projections Program

Table 2-7:
Projected Population and Percent Population by Race/Ethnicity in 2040 for TxDOT Districts (Scenario 00-04)

	Anglo		Black		Hispanic		Other		Total	
District	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Abilene	105,592	47.3	18,750	8.4	83,055	37.2	15,674	7.0	223,071	100.0
Amarillo	156,958	39.0	19,362	4.8	208,189	51.7	18,002	4.5	402,511	100.0
Atlanta	145,492	44.5	64,428	19.7	111,894	34.3	4,789	1.5	326,603	100.0
Austin	1,453,027	39.6	218,834	6.0	1,792,757	48.9	200,747	5.5	3,665,365	100.0
Beaumont	253,697	36.0	120,112	17.1	289,290	41.1	41,124	5.8	704,223	100.0
Brownwood	91,755	63.1	4,725	3.2	48,010	33.0	927	0.6	145,417	100.0
Bryan	202,043	45.6	65,165	14.7	159,753	36.0	16,577	3.7	443,538	100.0
Childress	20,509	57.8	3,058	8.6	11,587	32.7	330	0.9	35,484	100.0
Corpus Christi	112,110	20.6	23,454	4.3	386,187	70.8	23,553	4.3	545,304	100.0
Dallas	3,262,131	31.1	893,303	8.5	5,385,897	51.4	940,620	9.0	10,481,951	100.0
El Paso	37,103	4.0	21,115	2.3	813,430	87.4	59,116	6.4	930,764	100.0
Fort Worth	1,027,508	20.7	404,111	8.2	2,876,396	58.1	644,312	13.0	4,952,327	100.0
Houston	1,748,998	16.2	1,072,833	9.9	6,635,343	61.3	1,365,175	12.6	10,822,349	100.0
Laredo	20,782	3.3	1,485	0.2	600,485	93.9	16,644	2.6	639,396	100.0
Lubbock	152,078	36.1	27,159	6.4	225,358	53.4	17,064	4.0	421,659	100.0
Lufkin	167,493	47.0	51,245	14.4	132,166	37.1	5,753	1.6	356,657	100.0
Odessa	79,847	21.7	17,393	4.7	255,688	69.6	14,401	3.9	367,329	100.0
Paris	245,250	50.9	45,337	9.4	170,085	35.3	21,564	4.5	482,236	100.0
Pharr	76,845	3.3	3,985	0.2	2,226,613	94.4	50,883	2.2	2,358,326	100.0
San Angelo	49,665	38.5	4,345	3.4	71,638	55.6	3,251	2.5	128,899	100.0
San Antonio	696,557	24.5	152,365	5.4	1,726,702	60.7	270,652	9.5	2,846,276	100.0
Tyler	334,042	34.9	98,937	10.3	498,985	52.2	24,575	2.6	956,539	100.0
Waco	217,563	28.4	137,849	18.0	350,591	45.8	59,992	7.8	765,995	100.0
Wichita Falls	117,064	54.9	17,826	8.4	67,898	31.8	10,520	4.9	213,308	100.0
Yoakum	125,824	34.3	36,602	10.0	197,644	53.9	6,331	1.7	366,401	100.0
State of Texas	***10,899,933***	***25.0***	***3,523,778***	***8.1***	***25,325,641***	***58.1***	***3,832,576***	***8.8***	***43,581,928***	***100.0***

Source: Texas State Data Center Population Estimates and Projections Program

An Aging Population

In addition to changes in the racial and ethnic composition of the State, age patterns will impact transportation. Although a relatively young state overall (with the third youngest median age in the nation at 32.3 in 2000), Texas, like the rest of the nation, has more than 20 percent of its population in the "baby-boom" ages (i.e., 41-59 years of age in 2005) and, as a result, will show increasing numbers of elderly persons in the coming decades. In fact, the age and race/ethnicity characteristics of Texas' population are interrelated: non-Anglo status and youth status and Anglo and older age status. Thus, as of 2000, 57 percent of the population under 18 years of age was non-Anglo while 57 percent of the population 18 years of age or older was Anglo.

As is evident in the projections (see Figures 2-2 through 2-3 and Tables 2-8 through 2-10), older populations will increase at more rapid rates than those at younger ages. Under either of the projection scenario examined in this report, the rate of increase for the population 65 years of age and older between 2000 and 2040 is approximately double the rate for the population as a whole. As a result, the population in this age group grows from 2.2 million in 2005 to 7.1 million in the moderate (00-04) projection scenario and 8.2 million in the (1.0) scenario. In both projection scenarios, the percentage of the population 65 years of age and older becomes at least 15.9 percent of the total population by 2040, up from 9.8 percent of the total population in 2005. No other age group will grow as rapidly as the population 65 years and older. As a result, the median age of the population will become between 38.1 and 38.8 years of age by 2040 under these scenarios, up from 32.3 in 2000.

Shifts in the age structure could lead to changes in the demand for transportation services in several ways. An increase in the number of individuals of licensing age increases the number of potential drivers on Texas roads. In addition, growth in the size of the population in the primary working ages of 25 to 64, will increase the amount of daily peak (i.e. commute) travel while growth in the other age groups impacts non-peak travel demand. In 2005, 52.1 percent of the total population was in the peak daily travel ages of 25 to 64. This will increase slightly to 53.7 percent of the total population in 2040.

As with changes in racial/ethnic diversity of the population, changes in the number of people of older ages impact all areas of the State. Six districts will have at least 20.1 percent of their population in the oldest age groups (ages 65 and above). Generally, these districts have a more rural oriented population than others, however all districts will see substantial growth in the older age groups. In fact, at least 12 percent of the total population of each TxDOT district will be age 65 years or older in 2040. As a result, the median ages of all districts increase between 2000 and 2040 (see Table 2-8).

Changes in the age structure and race/ethnicity of the State are readily apparent in Figure 2-2 and 2-3. As shown in these figures, the majority of the population in older age groups in 2000 was Anglo, while those in younger age groups were primarily Hispanic (Figure 2-2). As the population transitions to a more non-Anglo population, all but the oldest age group will be majority Hispanic by 2040 (Figure 2-3).

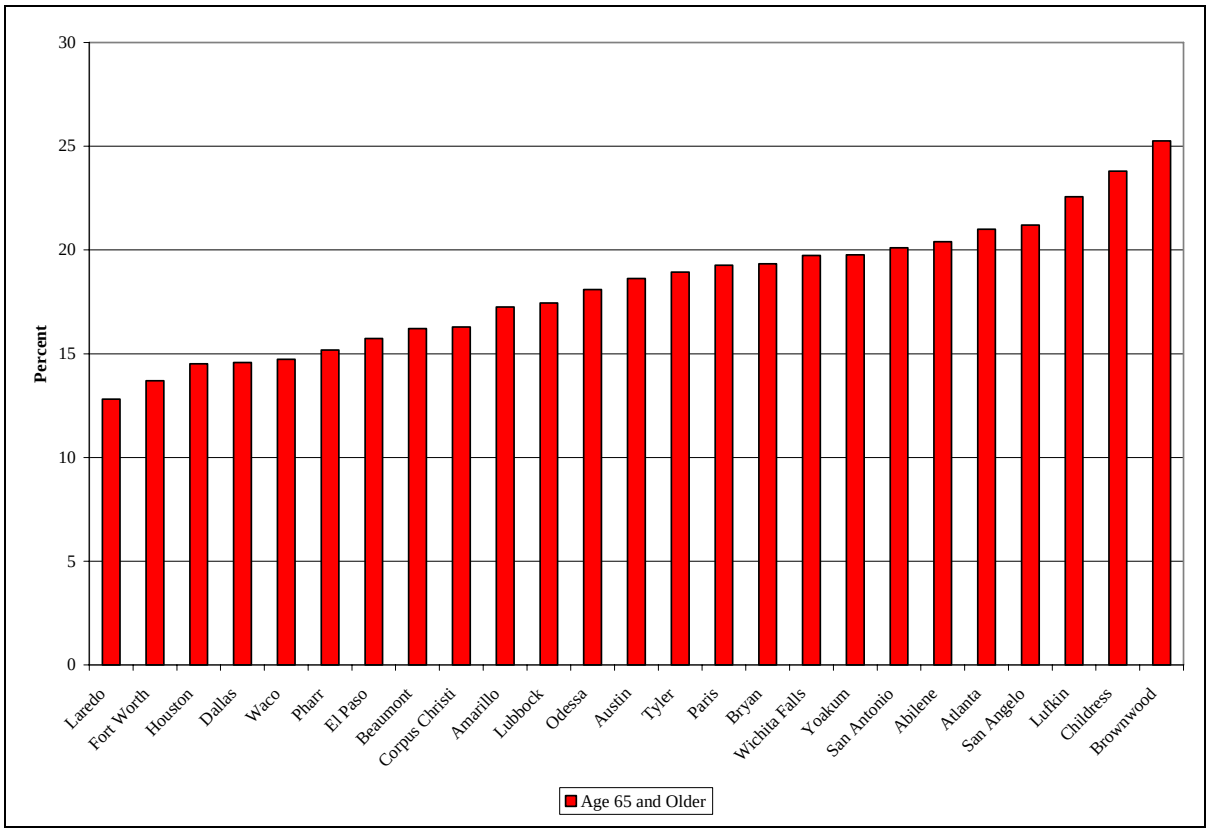

Figure 2-1: Percent of Population 65 or Older in 2040 by TxDOT District, (Scenario 1.0)

Table 2-8:
Median Age by TxDOT District, 2000, 2020 and 2040 Assuming Alternative Scenarios

		2020		2040	
District	**2000**	**1.0**	**00-04**	**1.0**	**00-04**
Abilene	35.2	37.4	37.4	40.5	39.3
Amarillo	34.2	36.0	36.2	39.5	39.7
Atlanta	37.0	39.8	39.3	40.7	41.4
Austin	31.5	37.2	37.6	40.7	41.4
Beaumont	35.6	36.5	36.1	37.7	37.1
Brownwood	39.2	40.1	38.8	43.8	41.9
Bryan	29.7	34.6	33.6	38.7	36.6
Childress	40.1	38.3	38.9	41.4	44.1
Corpus Christi	33.4	34.7	34.4	38.2	36.5
Dallas	31.6	35.5	36.6	38.0	39.9
El Paso	30.1	32.7	32.7	38.0	36.6
Fort Worth	33.0	34.1	34.7	35.5	36.9
Houston	31.9	34.6	35.6	37.7	39.1
Laredo	27.9	30.0	29.8	33.8	32.8
Lubbock	31.7	33.8	33.4	37.2	36.0
Lufkin	36.5	39.4	38.4	40.8	39.9
Odessa	33.2	34.5	34.5	38.0	37.4
Paris	37.2	38.9	38.6	40.1	39.0
Pharr	27.9	30.5	30.5	35.6	35.1
San Angelo	35.6	37.3	37.3	41.6	40.8
San Antonio	33.1	36.0	35.8	41.4	40.6
Tyler	37.0	38.5	37.9	37.1	37.2
Waco	30.9	35.0	35.5	38.8	38.3
Wichita Falls	35.9	36.9	37.0	39.1	39.2
Yoakum	36.7	37.0	36.6	39.7	39.0
Texas	***32.3***	***35.1***	***35.5***	***38.1***	***38.8***

Source: Texas State Data Center Population Estimates and Projections Program

Table 2-9:
Population and Percent Population by Major Age Groups in 2040
for TxDOT Districts (Scenario 1.0)

	<25		25-64		65 and over		Total	
District	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Abilene	70,523	28.4	127,221	51.2	50,665	20.4	248,409	100.0
Amarillo	161,166	29.3	293,824	53.4	94,816	17.2	549,806	100.0
Atlanta	117,357	29.7	194,295	49.2	82,862	21.0	394,514	100.0
Austin	1,350,967	27.3	2,680,906	54.1	922,373	18.6	4,954,246	100.0
Beaumont	292,990	31.6	483,689	52.2	150,322	16.2	927,001	100.0
Brownwood	40,661	28.4	66,348	46.3	36,161	25.3	143,170	100.0
Bryan	174,786	30.6	286,511	50.1	110,555	19.3	571,852	100.0
Childress	10,952	28.7	18,156	47.5	9,094	23.8	38,202	100.0
Corpus Christi	269,701	30.0	482,405	53.7	146,336	16.3	898,442	100.0
Dallas	3,826,442	30.4	6,914,875	55.0	1,833,792	14.6	12,575,109	100.0
El Paso	381,380	30.0	689,445	54.3	199,919	15.7	1,270,744	100.0
Fort Worth	1,612,407	33.7	2,520,117	52.6	655,502	13.7	4,788,026	100.0
Houston	3,718,543	29.7	6,981,231	55.8	1,816,737	14.5	12,516,511	100.0
Laredo	318,603	35.9	454,598	51.3	113,654	12.8	886,855	100.0
Lubbock	155,572	32.4	240,780	50.1	83,773	17.4	480,125	100.0
Lufkin	139,491	30.5	214,192	46.9	103,029	22.6	456,712	100.0
Odessa	116,695	31.3	188,270	50.6	67,353	18.1	372,318	100.0
Paris	168,862	29.6	291,856	51.1	109,911	19.3	570,629	100.0
Pharr	965,265	35.1	1,365,886	49.7	417,017	15.2	2,748,168	100.0
San Angelo	47,107	27.2	89,148	51.6	36,653	21.2	172,908	100.0
San Antonio	890,565	28.2	1,630,363	51.7	634,360	20.1	3,155,288	100.0
Tyler	360,207	33.2	518,176	47.8	205,208	18.9	1,083,591	100.0
Waco	339,799	28.5	676,138	56.8	175,474	14.7	1,191,411	100.0
Wichita Falls	86,650	30.6	140,992	49.7	55,977	19.7	283,619	100.0
Yoakum	130,329	30.3	214,537	49.9	84,978	19.8	429,844	100.0
State of Texas	***15,747,020***	***30.5***	***27,763,959***	***53.7***	***8,196,521***	***15.9***	***51,707,500***	***100.0***

Source: Texas State Data Center Population Estimates and Projections Program

Table 2-10:
Population and Percent Population by Major Age Groups in 2040
for TxDOT Districts (Scenario 00-04)

	<25		25-64		65 and over		Total	
District	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Abilene	65,172	29.2	114,334	51.3	43,565	19.5	223,071	100.0
Amarillo	118,158	29.4	210,676	52.3	73,677	18.3	402,511	100.0
Atlanta	93,659	28.7	163,741	50.1	69,203	21.2	326,603	100.0
Austin	976,874	26.7	1,999,628	54.6	688,863	18.8	3,665,365	100.0
Beaumont	224,517	31.9	365,284	51.9	114,422	16.2	704,223	100.0
Brownwood	42,792	29.4	66,608	45.8	36,017	24.8	145,417	100.0
Bryan	147,865	33.3	213,316	48.1	82,357	18.6	443,538	100.0
Childress	9,654	27.2	16,185	45.6	9,645	27.2	35,484	100.0
Corpus Christi	175,458	32.2	279,267	51.2	90,579	16.6	545,304	100.0
Dallas	2,967,752	28.3	5,858,262	55.9	1,655,937	15.8	10,481,951	100.0
El Paso	295,199	31.7	493,035	53.0	142,530	15.3	930,764	100.0
Fort Worth	1,566,438	31.6	2,704,454	54.6	681,435	13.8	4,952,327	100.0
Houston	3,086,032	28.5	6,059,382	56.0	1,676,935	15.5	10,822,349	100.0
Laredo	240,221	37.6	319,162	49.9	80,013	12.5	639,396	100.0
Lubbock	141,176	33.5	208,338	49.4	72,145	17.1	421,659	100.0
Lufkin	110,117	30.9	166,464	46.7	80,076	22.5	356,657	100.0
Odessa	117,537	32.0	183,696	50.0	66,096	18.0	367,329	100.0
Paris	147,417	30.6	240,082	49.8	94,737	19.6	482,236	100.0
Pharr	836,228	35.5	1,172,211	49.7	349,887	14.8	2,358,326	100.0
San Angelo	36,796	28.5	63,502	49.3	28,601	22.2	128,899	100.0
San Antonio	810,290	28.5	1,496,584	52.6	539,402	19.0	2,846,276	100.0
Tyler	308,629	32.3	474,348	49.6	173,562	18.1	956,539	100.0
Waco	225,426	29.4	418,090	54.6	122,479	16.0	765,995	100.0
Wichita Falls	65,790	30.8	102,501	48.1	45,017	21.1	213,308	100.0
Yoakum	113,363	30.9	177,312	48.4	75,726	20.7	366,401	100.0
State of Texas	***12,922,560***	***29.7***	***23,566,462***	***54.1***	***7,092,906***	***16.3***	***43,581,928***	***100.0***

Source: Texas State Data Center Population Estimates and Projections Program

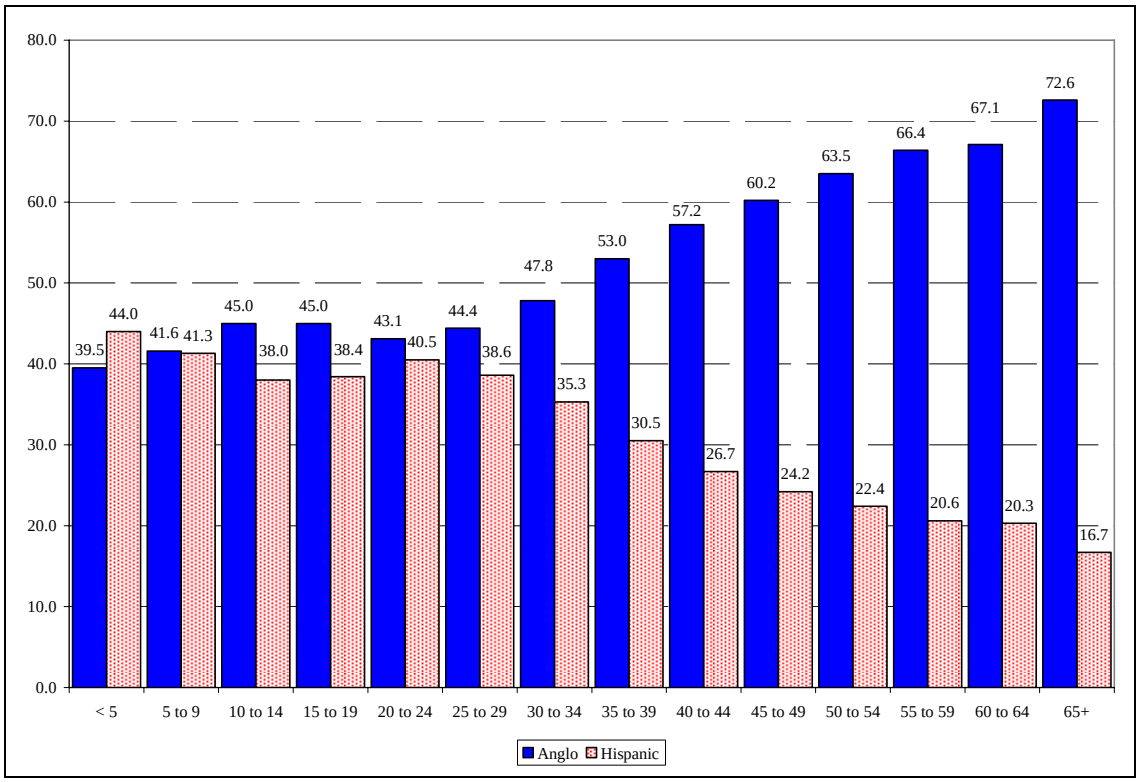

Figure 2-2: Percent of Texas Population by Age Group and Ethnicity, 2000

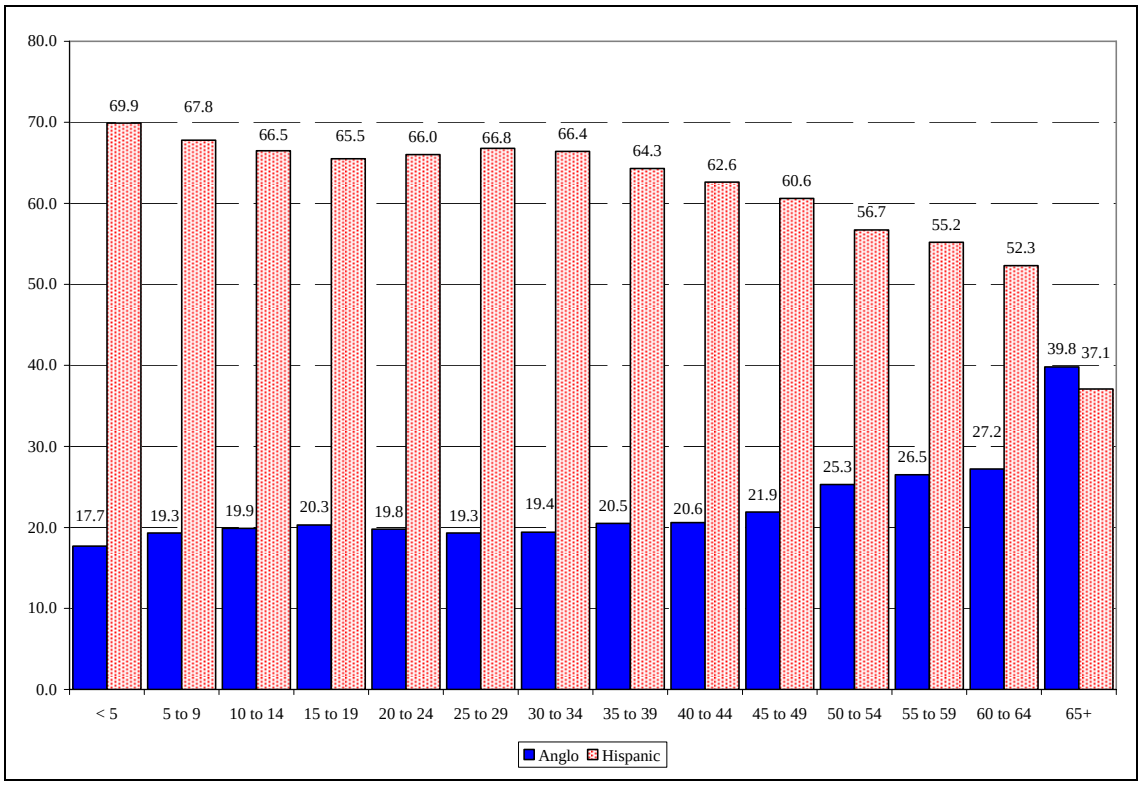

Figure 2-3: Percent of Texas Population by Age Group and Ethnicity, 2040 (Population Projection Scenario 1.0)

Household Size and Family Structure

Texas household change is also of critical importance for transportation planning. How populations put themselves together to live in groups affects the number and type of units that utilize transportation services and the characteristics of these households affect both their direct use of transportation services and their economic resources for using such services. Relative to households in Texas and elsewhere in the nation, three patterns have tended to prevail in recent decades. First, the number of households has increased rapidly as a result of growth in the population in household formation ages, second the size of households has declined, and third, the forms of households have continued to diversify.

Thus, as shown in Table 2-11 until recently the number of households has tended to grow more rapidly than the population. The number of households in Texas increased by 23.6 percent in the 1960s, by 43.7 percent in the 1970s, and by 23 percent in the 1980s while the population was increasing by 16.9 percent, 27.1 percent, and 19.4 percent in the 1960s, 1970s, and 1980s respectively. However, in the 1990s the number of households in Texas increased by 21.8 percent while the population increased by 22.8 percent. These patterns were largely attributable to two factors. The earlier periods, particularly the 1970s, saw large proportions of the population (e.g., of the baby-boomers) concentrated in key household formation ages (ages 25+) while the 1990s witnessed declines in this concentration and showed larger proportions of population growth due to the Hispanic population which has larger households resulting in larger numbers of population per housing unit. The fact that the values for the nation, which has a smaller proportion of Hispanics, show a consistent pattern of greater growth in the number of households than population throughout the 1990s, further verifies the effects of Hispanic population growth on recent population patterns in Texas.

Table 2-11:
Number and Percent Change in Households in the United States and Texas, 1960-2000

	1960	1970	1980	1990	2000
U.S.	53,021,343	63,616,135	80,467,427	91,947,410	105,480,101
Texas	2,777,982	3,433,996	4,934,936	6,070,937	7,393,354

	Percent Change in Households			
	1960-1970	1970-1980	1980-1990	1990-2000
U.S.	20.0	26.5	14.3	14.7
Texas	23.6	43.7	23.0	21.8

Source: U.S. Bureau of the Census, Census of Population and Housing, for each year indicated.

Despite recent declines in the levels of household growth compared to population change, the number of households has tended to grow rapidly because of a second important trend in households, a decrease in average household size. Figure 2-4 shows that declines in the average size of households have been substantial with average household size declining from 3.4 in 1950 to 2.7 in 2000, a decrease of more than 20 percent. Only the rapid growth in the number of Hispanic households with larger size curtailed this decline in the 1990s.

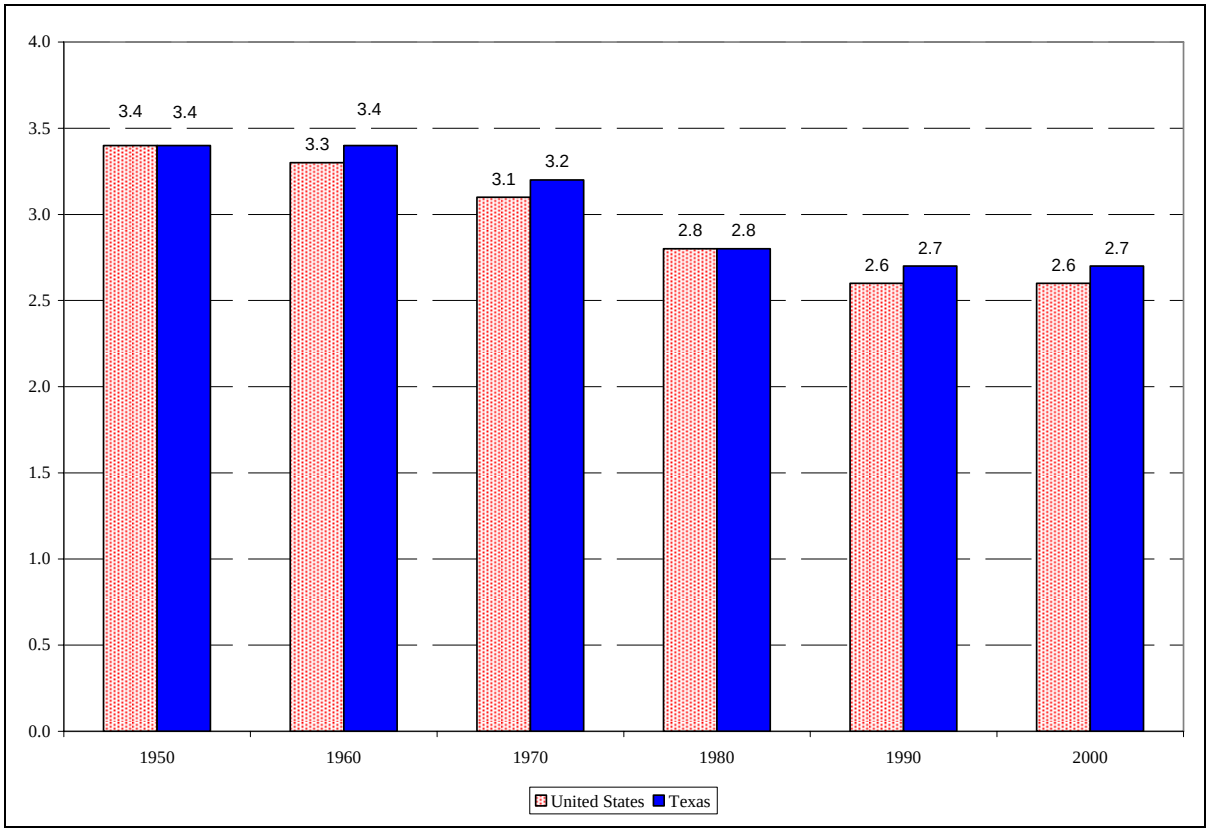

Figure 2-4: Average Persons per Household in the United State and Texas, 1950-2000

In many ways the third trend in household change - large differences in the rates of growth of different types of households - may be more important than the first two because it has markedly affected the buying power of households and hence their use of different types of services, including transportation. For instance, lower income households are less likely to own vehicles. At the same time, as household income increases, person trips per household also rise (Hu and Reuscher 2004).

There are two dimensions of this change in types. First, nonfamily households (that is, those consisting of one or more persons living in the same housing unit but not related) have increased substantially faster than family households (households of two or more people related by kinship, marriage or adoption) and second, within family households single-parent households have increased substantially faster than married couple households. As shown in Table 2-12 in each of the last three decades the number of non-family households has increased more rapidly than the number of family households and within family household the number of male and female householder households have increased faster than the number of married-couple households. For example in the 1970s the number of family households increased by slightly less than 31 percent while the number of nonfamily households increased by more than 100 percent. In addition, the numbers of married couple households increased by about 26 percent while both types (male and female) of single adult families increased by more than 64 percent. Even in the 1990s when growth in Texas was fueled by larger proportions of Hispanics who are more likely to live in family households and in married couple households than single-adult households such general trends continued.

Table 2-12:
Percent of and Percent Change in Texas Households by Type, 1970-2000

	Year				Percent Change in Number of Households		
Size/Type of Household	**1970**	**1980**	**1990**	**2000**	**1970-1980**	**1980-1990**	**1990-2000**
Total Households (000s)	4,434	4,929	6,071	7,393	43.5	23.2	21.8
Households by Type							
Family	81.8	74.6	71.6	71.0	30.9	18.1	20.8
Married couple	71.5	62.6	56.6	54.0	25.7	11.2	16.1
Male householder	2.0	2.5	3.4	4.3	75.9	69.3	55.2
Female householder	8.3	9.5	11.6	12.7	64.4	50.2	33.6
Nonfamily	18.2	24.4	28.4	29.0	100.5	38.0	24.2

Source: U.S. Bureau of the Census, Census of Population and Housing, for each year indicated.

In short, the patterns of household change point to increasing numbers of smaller and more diverse households, trends mitigated in part by the increasing proportion of total population growth that is due to non-Anglo populations. The data shown below for the future point to an amalgamation of age, race/ethnicity as well as household trends.

Projected Patterns of Household Change

The patterns of future household growth show the pervasive effects of non-Anglo population patterns. As shown in Tables 2-13 and 2-14, the non-Anglo headed households will have more significant growth than Anglo headed households, such that by 2040, over 52 percent of all households will be headed by non-Anglos. The fact that a majority of future household growth will be due to growth in the Hispanic population is evident in that both of the projections for the future show increases in the growth in family compared to nonfamily households. As shown in Table 2-15, the percentage of family households is projected to increase from 71 percent in 2000 to between 74.8 and 75.0 percent in 2040 with a similar decline in family households. The data in Table 2-16 show how significant these changes will be. In this table, the distribution of the same number of projected households as in table 2-15 is shown with the projected distribution by type under the 1.0 scenario and that under the same scenario but with the same percentage distribution of households by type as existed in 2000. As a result of changes in the composition of the population, the number of family households increases by more than 764,000 more than would be the case under the percentage distribution of household forms in 2000 while the number of nonfamily households would decline by the same amount. Equally important, the projected distribution will substantially decrease the number of single-adult households.

Table 2-13:
Number and Percent of Households by Race/Ethnicity, 2000-2040

	Anglo		Black		Hispanic		Other		Total
Year	Number	%	Number	%	Number	%	Number	%	Number
2000	4,540,078	61.4	843,712	11.4	1,789,623	24.2	219,941	3.0	7,393,354
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)									
2010	4,956,474	52.7	1,070,983	11.4	2,958,257	31.5	415,000	4.4	9,400,714
2020	5,340,044	44.2	1,334,131	11.0	4,692,780	38.8	723,237	6.0	12,090,192
2030	5,604,665	36.1	1,587,034	10.2	7,125,091	46.0	1,188,067	7.7	15,504,857
2040	5,678,030	28.7	1,807,410	9.1	10,437,038	52.8	1,848,591	9.3	19,771,069
Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)									
2010	4,785,251	52.7	1,033,681	11.4	2,861,732	31.5	400,339	4.4	9,081,003
2020	4,980,625	44.3	1,238,966	11.0	4,355,197	38.7	669,063	6.0	11,243,851
2030	5,059,995	36.6	1,415,996	10.2	6,311,837	45.6	1,049,672	7.6	13,837,500
2040	4,965,188	29.4	1,548,746	9.2	8,802,614	52.2	1,559,124	9.2	16,875,672

Source: Texas State Data Center Population Estimates and Projections Program.

Table 2-14:
Percent Change in Households by Race/Ethnicity, 2000-2040

Year	Anglo	Black	Hispanic	Other	Total
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)					
2000-2010	9.2	26.9	65.3	88.7	27.2
2010-2020	7.7	24.6	58.6	74.3	28.6
2020-2030	13.1	19.0	51.8	64.3	28.2
2030-2040	14.6	13.9	46.5	55.6	27.5
2000-2040	25.1	53.3	483.2	740.5	167.4
Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)					
2000-2010	5.4	22.5	59.9	82.0	22.8
2010-2020	4.1	19.9	52.2	67.1	23.8
2020-2030	1.6	14.3	44.9	56.9	23.1
2030-2040	(1.9)	9.4	39.5	48.5	22.0
2000-2040	9.4	83.6	391.9	608.9	128.3

Source: Texas State Data Center Population Estimates and Projections Program.

Table 2-15:
Number and Percent of Households by Type of Household and Race/Ethnicity of Householder in 2000 and Projections for 2040 Assuming Alternative Projection Scenarios

Family Type	Anglo		Black		Hispanic		Other		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
2000										
Family households:	3,047,023	67.1	576,324	68.3	1,463,353	81.8	161,094	73.2	5,247,794	71.0
Married-couple family:	2,524,945	55.6	293,195	34.8	1,039,515	58.1	132,086	60.1	3,989,741	54.0
With own children <18	1,077,641	23.7	155,495	18.4	689,684	38.5	78,808	35.8	2,001,628	27.1
No own children <18	1,447,304	31.9	137,700	16.4	349,831	19.6	53,278	24.3	1,988,113	26.9
Other family:	522,078	11.5	283,129	33.6	423,838	23.7	29,008	13.2	1,258,053	17.0
Male householder, no spouse present:	138,641	3.1	44,957	5.3	126,459	7.1	10,407	4.7	320,464	4.3
With own children <18	72,840	1.6	22,560	2.7	58,594	3.3	3,420	1.6	157,414	2.1
No own children <18	65,801	1.5	22,397	2.6	67,865	3.8	6,987	3.1	163,050	2.2
Female householder, no spouse present:	383,437	8.4	238,172	28.3	297,379	16.6	18,601	8.5	937,589	12.7
With own children <18	217,395	4.8	149,299	17.7	187,609	10.5	9,985	4.5	564,288	7.6
No own children <18	166,042	3.6	88,873	10.6	109,770	6.1	8,616	4.0	373,301	5.1
Nonfamily households:	1,493,055	32.9	267,388	31.7	326,270	18.2	58,847	26.8	2,145,560	29.0
Male householder	1,236,907	27.2	228,911	27.1	241,493	13.5	44,830	20.4	1,752,141	23.7
Female householder	256,148	5.7	38,477	4.6	84,777	4.7	14,017	6.4	393,419	5.3
Total Households:	***4,540,078***	***100.0***	***843,712***	***100.0***	***1,789,623***	***100.0***	***219,941***	***100.0***	***7,393,354***	***100.0***
Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)										
2040										
Family households:	3,827,646	67.4	1,216,166	67.3	8,417,118	80.6	1,336,797	72.3	14,797,727	74.8
Married-couple family:	3,232,208	56.9	656,977	36.3	6,049,738	58.0	1,100,258	59.5	11,039,181	55.8
With own children <18	1,188,523	20.9	324,774	18.0	3,910,117	37.5	492,159	26.6	5,915,573	29.9
No own children <18	2,043,685	36.0	332,203	18.3	2,139,621	20.5	608,099	32.9	5,123,608	25.9
Other family:	595,438	10.5	559,189	30.9	2,367,380	22.7	236,539	12.8	3,758,546	19.0
Male householder, no spouse present:	154,530	2.7	91,649	5.1	799,411	7.7	78,056	4.2	1,123,646	5.7
With own children <18	74,996	1.3	41,774	2.3	335,497	3.2	20,887	1.1	473,154	2.4
No own children <18	79,534	1.4	49,875	2.8	463,914	4.5	57,169	3.1	650,492	3.3
Female householder, no spouse present:	440,908	7.8	467,540	25.8	1,567,969	15.0	158,483	8.6	2,634,900	13.3
With own children <18	213,467	3.8	261,093	14.4	925,494	8.9	59,260	3.2	1,459,314	7.4
No own children <18	227,441	4.0	206,447	11.4	642,475	6.1	99,223	5.4	1,175,586	5.9
Nonfamily households:	1,850,384	32.6	591,244	32.7	2,019,920	19.4	511,794	27.7	4,973,342	25.2
Male householder	1,582,284	27.9	513,564	28.4	1,474,782	14.1	420,329	22.7	3,990,959	20.2
Female householder	268,100	4.7	77,680	4.3	545,138	5.3	91,465	5.0	982,383	5.0
Total Households:	***5,678,030***	***100.0***	***1,807,410***	***100.0***	***10,437,038***	***100.0***	***1,848,591***	***100.0***	***19,771,069***	***100.0***

Table 2-15 (Continued)

Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)

2040										
Family households:	3,366,089	67.8	1,046,590	67.6	7,095,793	80.6	1,143,462	73.3	12,651,934	75.0
Married-couple family:	2,845,571	57.3	574,876	37.1	5,126,360	58.2	946,365	60.7	9,493,172	56.3
With own children <18	1,057,746	21.3	285,352	18.4	3,292,167	37.4	431,406	27.7	5,066,671	30.0
No own children <18	1,787,825	36.0	289,524	18.7	1,834,193	20.8	514,959	33.0	4,426,501	26.3
Other family:	520,518	10.5	471,714	30.5	1,969,433	22.4	197,097	12.6	3,158,762	18.7
Male householder, no spouse present:	134,851	2.7	78,197	5.0	668,505	7.6	64,389	4.1	945,942	5.6
With own children <18	65,607	1.3	35,607	2.3	280,981	3.2	17,727	1.1	399,922	2.4
No own children <18	69,244	1.4	42,590	2.7	387,524	4.4	46,662	3.0	546,020	3.2
Female householder, no spouse present:	385,667	7.8	393,517	25.5	1,300,928	14.8	132,708	8.5	2,212,820	13.1
With own children <18	186,843	3.8	218,172	14.1	762,945	8.7	50,721	3.3	1,218,681	7.2
No own children <18	198,824	4.0	175,345	11.4	537,983	6.1	81,987	5.2	994,139	5.9
Nonfamily households:	1,599,099	32.2	502,156	32.4	1,706,821	19.4	415,662	26.7	4,223,738	25.0
Male householder	1,368,533	27.6	436,674	28.2	1,252,020	14.2	343,034	22.0	3,400,261	20.1
Female householder	230,566	4.6	65,482	4.2	454,801	5.2	72,628	4.7	823,477	4.9
Total Households:	***4,965,188***	***100.0***	***1,548,746***	***100.0***	***8,802,614***	***100.0***	***1,559,124***	***100.0***	***16,875,672***	***100.0***

Source: Derived by the authors from U.S. Bureau of the Census and Texas State Data Center Population Estimates and Projections Program.

Table 2-16:
Total Number of Households by Type in 2040 Using the 1.0 Projection Scenario Compared to a Scenario that Assumes the Same Total Number of Households but the Same Race/Ethnic, Age and Householder Type Characteristics as in 2000

	Householder Assumptions		
Household Type	**2040 Projected Composition**	**Same as 2000 Composition**	**Difference**
Family households:	14,797,727	14,033,482	764,245
Married-couple family:	11,039,181	10,669,237	369,944
With own children <18	5,915,573	5,352,689	562,884
No own children <18	5,123,608	5,316,548	-192,940
Other family:	3,758,546	3,364,245	394,301
Male householder, no spouse present:	1,123,646	856,975	266,671
With own children <18	473,154	420,951	52,203
No own children <18	650,492	436,023	214,469
Female householder, no spouse present:	2,634,900	2,507,270	127,630
With own children <18	1,459,314	1,509,001	-49,687
No own children <18	1,175,586	998,270	177,316
Nonfamily households:	4,973,342	5,737,587	-764,245
Male householder	3,990,959	4,685,519	-694,560
Female householder	982,383	1,052,068	-69,685
Total Households:	***19,771,069***	***19,771,069***	***---***

Source: Derived by the authors from U.S. Bureau of the Census and Texas State Data Center Population Estimates and Projections Program.

The effects of differentials in socioeconomic resources due to population and household change are equally important. As shown in Table 2-17, whereas 14.9 percent of Anglo and Other headed households made $100,000 or more in 2000, only 8.4 of African-American and 4.2 percent of Hispanic households made more than $100,000. At the same time, 17.7 percent of African-American and 14.1 percent of Hispanic headed households made less than $10,000 per year compared to 7.5 percent of Anglos and 10.9 percent of persons in the Other racial/ethnic category. Table 2-18 shows what will occur if such differentials in income continue throughout the projection period. As shown in this table, the net effect is to decrease the number of high income and increase the number of low income households. Thus in 2000 constant dollars the number of households with income below $14,999 would increase by more than 977,000 and the number between 15,000 but less than 30,000 would increase by more than 644,000. On the other hand, the number of households with incomes of more than 100,000 would decrease by more than 700,000. What is evident then is that the projected changes in households are ones that will partially stabilize previous patterns of decline in family households but decrease the resources of such households. Since both household types and household resources affect patterns of transportation usage, these factors have substantial implications for future transportation needs.

Table 2-17:
Household Income in Texas by Income Category and Race/Ethnicity of Householder in 2000 and Projections for 2040 Using the Alternative Population Projections (Percentaged by Race/Ethnicity)

	Anglo		Black		Hispanic		Other		Total	
Household Income	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
2000										
$ <10,000	341,684	7.5	149,514	17.7	251,625	14.1	23,995	10.9	766,818	10.4
10,000 to 14,999	242,608	5.3	70,966	8.4	165,395	9.2	11,714	5.3	490,683	6.6
15,000 to 19,999	242,784	5.3	66,404	7.9	165,277	9.2	11,702	5.3	486,167	6.6
20,000 to 24,999	269,952	5.9	67,047	7.9	167,064	9.3	13,167	6.0	517,230	7.0
25,000 to 29,999	272,946	6.0	63,339	7.5	154,110	8.6	12,152	5.5	502,547	6.8
30,000 to 34,999	285,102	6.3	55,869	6.6	139,362	7.8	12,711	5.8	493,044	6.7
35,000 to 39,999	267,306	5.9	48,014	5.7	118,350	6.6	11,541	5.2	445,211	6.0
40,000 to 44,999	257,415	5.7	43,160	5.1	104,374	5.8	11,327	5.2	416,276	5.6
45,000 to 49,999	226,205	5.0	35,376	4.2	85,512	4.8	10,219	4.6	357,312	4.8
50,000 to 59,999	422,419	9.3	59,528	7.1	134,970	7.5	19,999	9.1	636,916	8.6
60,000 to 74,999	506,652	11.2	62,038	7.4	129,151	7.2	24,202	11.0	722,043	9.8
75,000 to 99,999	530,742	11.7	51,636	6.1	98,607	5.5	24,495	11.1	705,480	9.5
100,000 to 124,999	263,225	5.8	50,412	6.0	35,631	2.0	13,145	6.0	362,413	4.9
125,000 to 149,999	142,048	3.1	8,489	1.0	15,018	0.8	7,899	3.6	173,454	2.3
150,000 to 199,999	129,469	2.9	5,723	0.7	11,771	0.7	6,481	2.9	153,444	2.1
200,000+	139,521	3.1	6,197	0.7	13,406	0.7	5,192	2.4	164,316	2.2
Total	***4,540,078***	***100.0***	***843,712***	***100.0***	***1,789,623***	***100.0***	***219,941***	***100.0***	***7,393,354***	***100.0***

Table 2-17 (Continued)

Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)

2040										
$ <10,000	486,983	8.6	358,260	19.8	1,567,181	15.0	272,568	14.7	2,684,992	13.6
10,000 to 14,999	367,563	6.5	167,702	9.3	998,196	9.6	121,417	6.6	1,654,878	8.4
15,000 to 19,999	351,452	6.2	147,639	8.2	973,490	9.3	119,763	6.5	1,592,344	8.1
20,000 to 24,999	368,878	6.5	142,055	7.9	969,214	9.3	117,596	6.4	1,597,743	8.1
25,000 to 29,999	361,139	6.4	131,783	7.3	886,261	8.5	102,328	5.5	1,481,511	7.5
30,000 to 34,999	364,581	6.4	115,241	6.4	795,762	7.6	110,123	6.0	1,385,707	7.0
35,000 to 39,999	335,985	5.9	98,207	5.4	676,862	6.5	92,934	5.0	1,203,988	6.1
40,000 to 44,999	316,081	5.6	87,819	4.9	595,273	5.7	89,484	4.8	1,088,657	5.5
45,000 to 49,999	274,914	4.8	72,040	4.0	485,838	4.7	78,331	4.2	911,123	4.6
50,000 to 59,999	500,982	8.8	120,454	6.7	766,481	7.3	150,911	8.2	1,538,828	7.8
60,000 to 74,999	583,827	10.3	123,763	6.8	730,807	7.0	177,186	9.6	1,615,583	8.2
75,000 to 99,999	598,778	10.5	103,274	5.7	559,200	5.4	175,370	9.5	1,436,622	7.3
100,000 to 124,999	297,492	5.2	96,487	5.3	202,075	1.9	96,455	5.2	692,509	3.5
125,000 to 149,999	160,183	2.8	16,853	0.9	85,690	0.8	57,135	3.1	319,861	1.6
150,000 to 199,999	146,680	2.6	11,882	0.7	67,307	0.6	48,435	2.6	274,304	1.4
200,000+	162,512	2.9	13,951	0.8	77,401	0.7	38,555	2.1	292,419	1.5
Total	***5,678,030***	***100.0***	***1,807,410***	***100.0***	***10,437,038***	***100.0***	***1,848,591***	***100.0***	***19,771,069***	***100.0***

Table 2-17 (Continued)

Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)

2040										
$ <10,000	424,850	8.6	307,837	19.9	1,331,874	15.1	228,869	14.7	2,293,430	13.6
10,000 to 14,999	320,347	6.5	144,053	9.3	845,288	9.6	102,075	6.5	1,411,763	8.4
15,000 to 19,999	306,532	6.2	126,630	8.2	822,017	9.3	100,702	6.5	1,355,881	8.0
20,000 to 24,999	322,045	6.5	121,690	7.9	816,920	9.3	99,083	6.4	1,359,738	8.1
25,000 to 29,999	315,470	6.4	112,837	7.3	746,206	8.5	86,302	5.5	1,260,815	7.5
30,000 to 34,999	318,676	6.4	98,648	6.4	669,424	7.6	92,832	6.0	1,179,580	7.0
35,000 to 39,999	293,776	5.9	84,048	5.4	569,512	6.5	78,440	5.0	1,025,776	6.1
40,000 to 44,999	276,496	5.6	75,147	4.9	500,693	5.7	75,554	4.8	927,890	5.5
45,000 to 49,999	240,533	4.8	61,646	4.0	408,452	4.6	66,174	4.2	776,805	4.6
50,000 to 59,999	438,543	8.8	103,058	6.7	644,356	7.3	127,526	8.2	1,313,483	7.8
60,000 to 74,999	511,363	10.3	105,845	6.8	614,093	7.0	149,818	9.6	1,381,119	8.2
75,000 to 99,999	524,689	10.6	88,330	5.7	470,021	5.3	148,346	9.5	1,231,386	7.3
100,000 to 124,999	260,674	5.3	82,422	5.3	169,850	1.9	81,553	5.2	594,499	3.5
125,000 to 149,999	140,364	2.8	14,412	0.9	72,078	0.8	48,322	3.1	275,176	1.6
150,000 to 199,999	128,520	2.6	10,173	0.7	56,630	0.6	40,937	2.6	236,260	1.4
200,000+	142,310	2.9	11,970	0.8	65,200	0.7	32,591	2.1	252,071	1.5
Total	***4,965,188***	***100.0***	***1,548,746***	***100.0***	***8,802,614***	***100.0***	***1,559,124***	***100.0***	***16,875,672***	***100.0***

Source: Derived by the authors from U.S. Bureau of the Census and Texas State Data Center Population Estimates and Projections Program.

Table 2-18:
Total Number of Households by Income in 2040 Using Population Projection Scenario 1.0 Compared to a Scenario that Uses the Same Projected Number of Households for 2040 but Assumes the Same Race/Ethnic, Age and Household Characteristics of the 2000 Population

	Householder Assumptions		
Household Income	**2040 Projected Composition**	**Same as 2000 Composition**	**Difference**
$ <14,000	4,339,870	3,362,769	-977,101
15,000-29,999	4,671,598	4,027,147	-644,451
30,000-49,999	4,589,475	4,577,755	-11,720
50,000-74,999	3,154,411	3,634,084	479,673
75,000-99,999	1,436,622	1,886,572	449,950
100,000-124,999	692,509	969,153	276,644
125,000-149,999	319,861	463,845	143,984
150,000-199,999	274,304	410,335	136,031
200,000+	292,419	439,409	146,990
Total	***19,771,069***	***19,771,069***	**---**

Source: Derived by the authors from U.S. Bureau of the Census and Texas State Data Center Population Estimates and Projections Program.

Conclusion

Among the most significant changes in the Texas population are the rapid growth of those aged 65 and older, the shift to a non-Anglo, and eventually, a Hispanic majority, and related changes in household types. The first two of these changes are already impacting the State of Texas and can be seen in the age structure of the State – with an aging population consisting primarily of Anglos coupled with a younger population consisting primarily of Hispanics. By 2040, the population of all but the oldest ages will have a higher percentage of Hispanics than Anglos. Similarly, it is evident that such changes will likely stabilize household structure while substantially reducing the overall level of resources in the average household. Although one cannot predict precisely how these changes will impact the transportation system in Texas, below we provide a summary of some of the potential impacts of these demographic trends on TxDOT and the Texas transportation system.

1. ***Growth in non-Anglo population.*** On average, Anglos are more likely to own a vehicle and drive more per year than any other group. Although vehicle ownership and driving rates for non-Anglo groups are converging with those of Anglos, they remain lower than Anglos as a whole. Analyses of national travel survey data indicate that differences in travel behaviors by race/ethnicity are due primarily to differences in incomes and residential location (see summaries of research in Battelle 2000). Thus, improvements in the socioeconomic status of non-Anglo groups could increase overall vehicle miles of travel. In addition, in the absence of such improvements, increases in the number of non-Anglo groups could further increase demand for public transportation.

2. ***Increase number and percentage of population of driving age.*** Although the population of all age groups will increase between 2005 and 2040, the slowest growth occurs among the youngest ages. A greater number and percentage of the population will be of driving age (age 16 and over) than today. On average, the highest person miles of travel are in the ages when most people are working and raising a family (age 25 to 64). Increases in this age group could impact overall transportation demand.

3. ***Increase in the number and percentage of the population 65 years and older.*** The number and percentage of the population of driving age is influenced primarily by significant increases in the population 65 years and older. Increases in this population may have substantial impacts on the amount of off-peak travel and could potentially impact demand for specialized medical and other public transportation services. This may have particular ramification for public transportation services in rural areas of Texas.

4. ***Increase in family households and reduced household resources.*** Although it is difficult to project how such a combination of household trends will impact transportation, it is evident that the above noted trends will likely reduce the total number of households needing transportation services relative to what would be needed if the population was distributed across a larger number of households. Reduced household resources will likely decrease the overall level of expenditures for transportation and the level of public resources to support such services compared to a higher household income structure.

Overall, then the potential effects of changes in age, race/ethnicity and households characteristics on transportation are complex. In the chapters that follow, we delineate some of a multitude of the potential impacts of such elements of population change on the transportation system in Texas.

Chapter 3

Implications of Demographic Change on Driving, Daily Vehicle Miles of Travel and Driver Involvement in Crashes

As with total population change, the total number of drivers on Texas roads will increase substantially over the next thirty to thirty-five years. More importantly, however, the characteristics of these drivers will influence the aggregate demand on Texas roads since demographic and socioeconomic characteristics influence the ways that people travel, where they travel, and how much they travel. For instance, like with household income, Anglo, middle-aged, and married-couple families have higher rates of vehicle ownership, driver licensure rates, and daily vehicle miles of travel than other race/ethnic, age, and household groups (Murdock et al. 1997, 2003; Pisarski 2006). Change in the demographic characteristics of the Texas population highlighted in Chapters 1 and 2, point to alteration in the number and characteristics of Texas drivers, how much those drivers drive, and how many of those drivers will be involved in automobile crashes.

In this section we review the effects of changes in the demographic characteristics of the Texas population on automobile related transportation demand. First, we review historical trends in the number of drivers, rates of driving per 1,000 persons, and changes in the proportion of drivers by age and sex over time. Then, we estimate change in the number of drivers based upon projected compositional changes in the Texas population given two projection scenarios (one by age and sex and another by age and race/ethnicity). In these scenarios, we assume that the driving and licensing rates for a given age, sex, race/ethnicity group remains the same throughout the 2000 to 2040 time period included in the projection scenarios. This provides a base case scenario assuming that rates remain the same as they were in 2005.

After a discussion about the impacts on the number of drivers due to demographic changes, we discuss the implications for travel demand as measured in yearly vehicle miles of travel (VMT). We recognize that changes in public policy, land use, the economy, travel behaviors and numerous other factors will impact future changes in transportation use. Nevertheless, this analysis attempts to provide an illustrative overview of how the demographic change will affect aggregate travel demand.

Change in the characteristics of Texas drivers will also have implications for traffic safety. Crash rates are generally higher for the younger ages and decrease with age. With increases in the overall age of the population licensed to drive, rates of growth in driver involvement in vehicular crashes are likely to decrease from those seen historically. At the same time, increases in the number of drivers in older ages will lead to subsequent increases in the number of older drivers involved in traffic accidents. In order to understand the magnitude of these effects, we follow our discussion of changes in travel demand with an overview of how changes in the characteristics of Texas drivers will effect change in the number of drivers involved in crashes.

Trends in the Number of Licensed Drivers

In 1950, less than half of the population of Texas was licensed to drive. From 1950 to 1980, the percentage growth in the number of licensed drivers exceeded population growth significantly. Beginning in the 1980s, the number of drivers grew at a pace similar to that of the total population and by 1990, the number of licensed drivers as a proportion of the total population reached a virtual saturation point of 655.6 licensed drivers for every 1,000 people (that is, 65.6 percent, see Table 3-1). Changes in the number of licensed drivers continue to trend along with changes in the total population, although the number of drivers per 1,000 population has declined slightly.

Table 3-1:
Total Population, Total Licensed Drivers, Licensed Drivers per 1,000 Population and Percent Change in Texas, 1950-2005

	Number		Percent Change from Previous Time		Licensed Drivers Per 1,000 Population	
Year	Population	Drivers	Population	Drivers	Drivers	Percent Change from Previous Time
1950	7,711,194	2,796,862	-	-	362.7	-
1960	9,579,677	4,352,168	24.2%	55.6%	454.3	25.3%
1970	11,196,730	6,380,057	16.9%	46.6%	569.8	25.4%
1980	14,229,191	9,287,826	27.1%	45.6%	652.7	14.6%
1990	16,986,510	11,136,694	19.4%	19.9%	655.6	0.4%
2000	20,851,820	13,462,023	22.8%	20.9%	645.6	-1.5%
2005	22,859,968	14,659,390	8.9%	8.9%	641.3	-0.7%

Source : U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Highway Statistics Series; U.S.Census Bureau; Texas State Data Center Population Estimates and Projections Program.

As shown in Figure 3-1, majorities of the people in all age groups, except the oldest and youngest, were licensed to drive in 2005. At younger ages, individuals are acquiring the capability to drive. At the oldest ages, the lower proportions of drivers are a result of two primary factors: the increasing number of individuals without the physical capacity to drive and generational differences in driving among women. Historically, the proportion of women who were licensed to drive was less than that for men, regardless of age. Today, driving rates for women match those of men of the same age with the exception of the oldest ages. However, as Figure 3-2 indicates, the proportion of women who were drivers has also increased in the older ages over time. Although we cannot determine future trends in these factors, it appears that continued health improvements in the elderly along with the entrance of women who have driven their whole life will likely continue to increase the proportion of women drivers at older ages at a rate similar to what has occurred between 1990 and 2005.

Although these data do not include information on the number of drivers by race and ethnicity, decreases in the proportions of drivers at younger ages suggest that changes in the racial and ethnic composition of Texas may be influencing the driving population. Due primarily to socioeconomic factors, non-Anglo licensing rates are lower than that of Anglos (Pisarski 2006: 36). As noted elsewhere, Texas will increasingly become a State consisting of a large aging Anglo population and a younger Hispanic population. While the overwhelming majority of all Texans will continue to drive, without improvement in the socioeconomic status of non-Anglo groups, changes in the demographic composition of the State may moderate the long term growth in the number of drivers.

Although these data suggest differences in driving between Anglo and non-Anglo groups which may be influencing changes in the proportion of drivers at younger ages, limitations in the data available prevent us from attributing these changes totally to racial/ethnicity differences. These historical data were derived from the Federal Highway Administration, as reported by the Texas Department of Public Safety (DPS). These data include information on only the number of drivers by age and sex. Although the DPS obtains racial information, differences in the classification of racial/ethnic groups and how the information is collected and reported make it difficult to obtain rates that are sex, age, and race/ethnicity specific. In addition, race and ethnic information are not reported to the Federal Highway Administration nor were we able to access the DPS data. For these reasons, we prepared two separate analyses of the effects of demographic trends on the future driving population. In the first analysis, projections of the number of drivers are based on changes in the number of people by age and sex utilizing the FHWA drivers licensing data. In the second analysis, the National Household Transportation Survey for 2001 was utilized to project the number of drivers based upon the age and race/ethnicity characteristics of the population. It is thus not possible to measure the simultaneous effects of age, sex, and race/ethnicity changes. The following section provides an overview of the results of these two analyses.

Impacts on the Number of Drivers

Most Texans depend upon the personal car for the majority of their daily transportation needs. Thus, population growth alone will generate significant growth in the number of drivers on the road. Although the driving population will increase because of population growth, the characteristics of the population may decrease the rate of growth in some cases, while other characteristics may operate in ways that will increase the rate of growth in total drivers. For instance, in the past, women were less likely to drive than men and this is reflected in the fact that a smaller percentage of women in the older age groups were licensed to drive in 1990. These percentages have increased over the years as subsequent generations of women move through the life cycle. By 2005, the proportion of women who drive was equal to that of men for all but the older age groups (Figure 3-2).

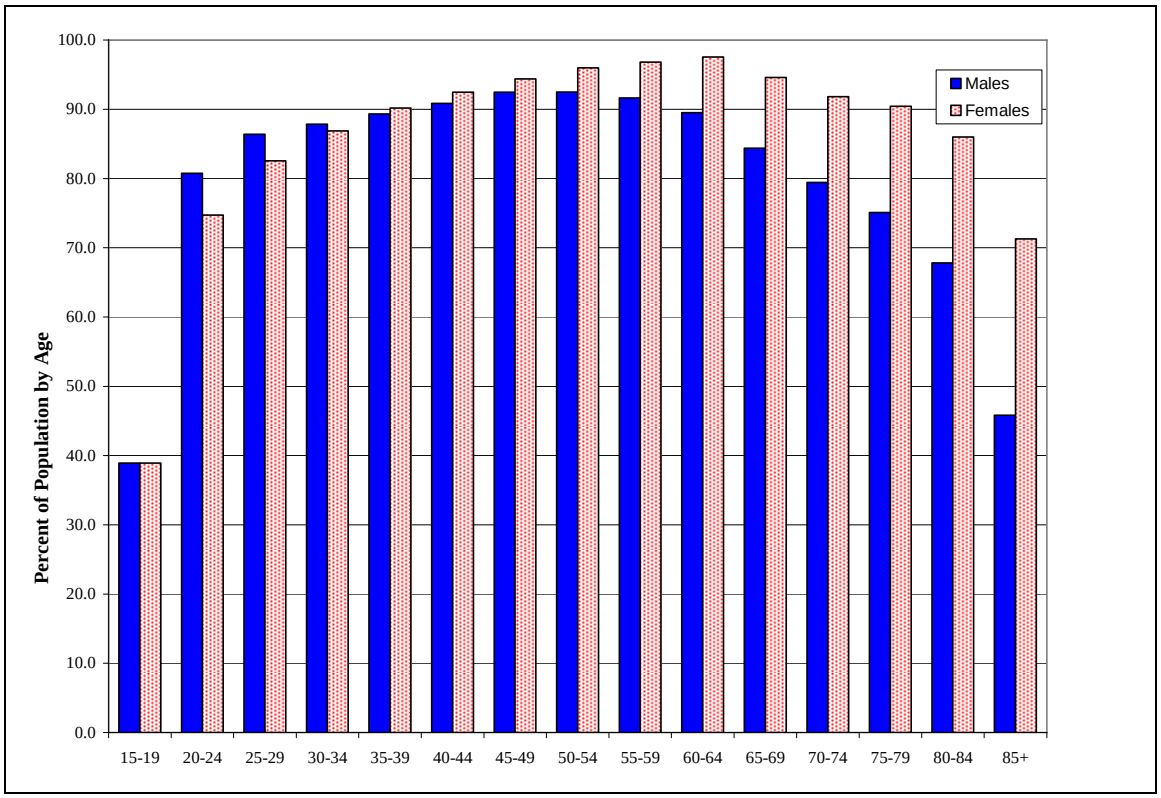

Figure 3-1: Percent of Total Population Who Were Licensed Drivers in 2005 by Sex and Age
Source: Derived from Federal Highway Administration and the Texas Population Estimates and Projections Program.

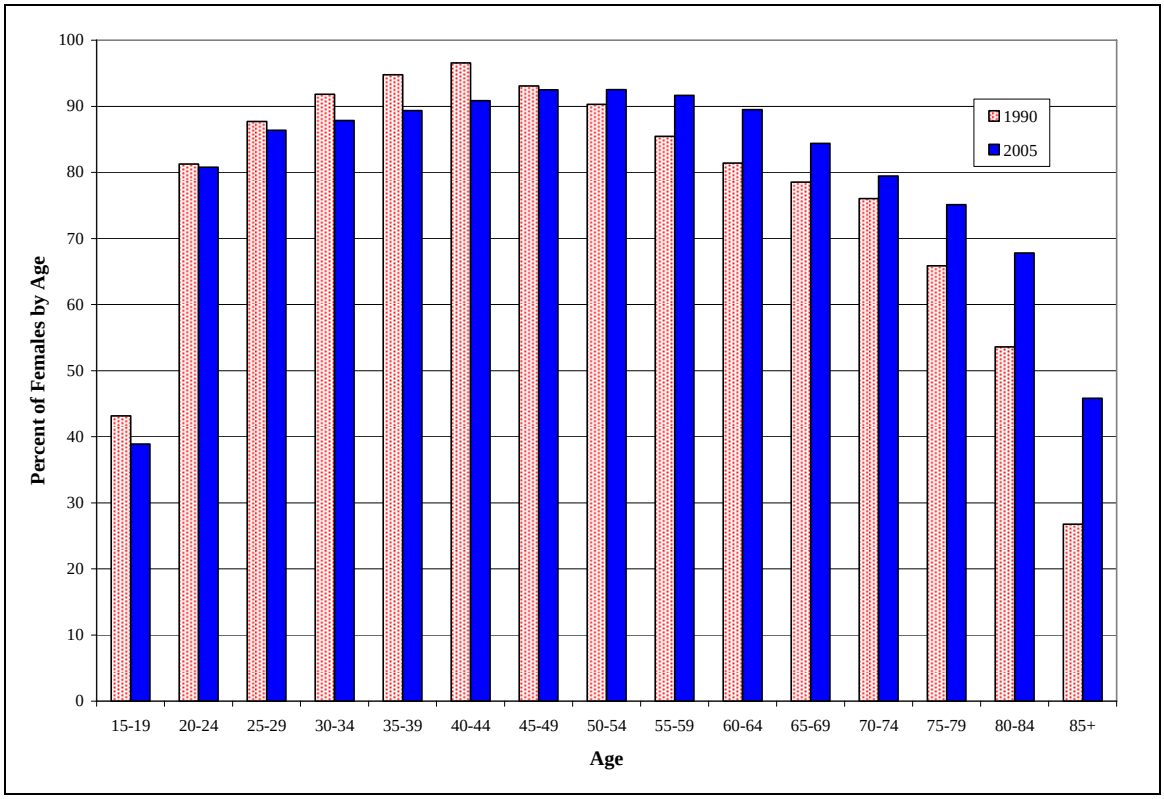

Figure 3-2: Percent of Women Who Were Licensed Drivers by Age, 1990 and 2005
Source: Derived from Federal Highway Administration and the Texas Population Estimates and Projections Program.

Projections of the Number of Drivers (Projected by Age and Sex)

In order to understand how changes in the age structure of the population may influence the number of Texas drivers, drivers licensing rates by age and sex for 2005 were applied to projections of the population utilizing the two alternative population projection scenarios: one that assumes the same migration patterns that occurred for Texas during the 1990s (Population Projection Scenario 1.0) and one that assumed similar migration patterns experienced between 2000 and 2004 (Projection Scenario 00-04). For this analysis, we used the FHWA data on driver's licenses by age and sex for 2005. These data are limited in that they may include duplications, individuals who may not live in the State, and the data will not include individuals who live in Texas but are licensed elsewhere or those who may drive but are not licensed. Despite these limitations, these data provide the most complete estimate available of the number of drivers by age and sex in Texas.

Using the first population projections scenario, there will be a projected total of 35.7 million drivers by 2040 (Table 3-2). This is a 144% increase in the number of drivers from 2005 and 165.2 percent from 2000 to 2040 under the 1.0 scenario. This compares to population growth of 148 percent showing that changes in the age and sex structure of the population lead to increases that exceed those related simply to changes in the size of the population. In fact, this total of 35.7 million drivers equates to 690.4 drivers per 1,000 persons in 2040 – significantly higher than the 641.3 in 2005. The number of drivers will increase at all ages, with the sharpest increases occurring in the older ages (see Table 3-4). In 2000, there were 90,211 drivers age 85 or older. By 2040, if these assumptions hold, there will be 593,921 drivers aged 85 or older. Indeed, by 2040, 18.6% of all drivers will be 65 years or older – compared to 11.3% in 2000. In this scenario, we assume similar rates for women drivers in 2005 going forward. As noted previously, the proportion of older women drivers has increased over the years. Thus, the higher longevity of women coupled with increased driving rates may increase the number of drivers at older ages even further than anticipated.

Under the more moderate population projection scenario that assumes similar rates of migration as those experienced between 2000 and 2004 (Scenario 00-04), the number of drivers will increase to 30.3 million drivers – a little over twice the number in 2005 and again increases exceed those based on changes in overall numbers of persons (i.e., the number of drivers increases by 124.9 percent from 2000 while the number of persons increases by 109 percent). Due to age and sex specific differences in net migration between these two scenarios, there will be a slightly larger number of drivers per 1,000 people under the 00-04 projection than that estimated under the 1.0 projection (694.8 under this scenario compared to 690.4 under the 1.0 scenario). As with the previous projection scenario, the largest percentage increases in the number of drivers will occur in the older ages (see Table 3-4).

Table 3-2:
Population, Number of Drivers, Drivers per 1,000 Population and Percent Change by Year, 2000-2040 Using Alternative Projection Scenarios (Projected by Age and Sex of Driver)

	Population		Drivers		Drivers Per 1,000 Population	
Year	1.0	00-04	1.0	00-04	1.0	00-04
2000	20,851,820	20,851,820	13,462,023	13,462,023	645.6	645.6
2005	22,859,968	22,859,968	14,659,390	14,659,390	641.3	641.3
2010	26,058,565	25,105,646	16,929,882	16,331,526	649.7	650.5
2020	32,736,693	30,252,539	21,720,158	20,133,830	663.5	665.5
2030	41,117,624	36,332,880	27,939,151	24,826,393	679.5	683.3
2040	51,707,500	43,581,928	35,699,922	30,279,288	690.4	694.8

Percent Change by Period

	Population		Drivers		Drivers Per 1,000 Population	
Period	1.0	00-04	1.0	00-04	1.0	00-04
2000-2005	9.6	9.6	8.9	8.9	-0.7	-0.7
2005-2010	14.0	9.8	15.5	11.4	1.3	1.4
2010-2020	25.6	20.5	28.3	23.3	2.1	2.3
2020-2030	25.6	20.1	28.6	23.3	2.4	2.7
2030-2040	25.8	20.0	27.8	22.0	1.6	1.7
2000-2040	148.0	109.0	165.2	124.9	6.9	7.6

Source: U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Highway Statistics Series; U.S.Bureau of the Census; Texas State Data Center Population Estimates and Projections Program.

Table 3-3:
Drivers by Sex and Projection Year 2000-2040 Using Alternative Population Projection Scenarios (Projected by Age and Sex of Driver)

	Migration Scenario 1.0				
Year	Male	%	Female	%	Total
2000	6,829,674	50.7	6,632,349	49.3	13,462,023
2005	7,371,617	50.3	7,287,773	49.7	14,659,390
2010	8,586,736	50.7	8,343,146	49.3	16,929,882
2020	11,184,937	51.5	10,535,221	48.5	21,720,158
2030	14,568,168	52.1	13,370,983	47.9	27,939,151
2040	18,827,108	52.7	16,872,814	47.3	35,699,922

	Migration Scenario 00-04				
Year	Male	%	Female	%	Total
2000	6,829,674	50.7	6,632,349	49.3	13,462,023
2005	7,371,617	50.3	7,287,773	49.7	14,659,390
2010	8,282,980	50.7	8,048,546	49.3	16,331,526
2020	10,369,150	51.5	9,764,680	48.5	20,133,830
2030	12,945,695	52.1	11,880,698	47.9	24,826,393
2040	15,971,610	52.7	14,307,677	47.3	30,279,288

Source: Derived from Texas Population Estimates and Projections Program; Federal Highway Administration.

Table 3-4:
Total and Percent of Drivers by Age and Percent Change, 2005-2040 Using Alternative Projection Scenarios (Projected by Age and Sex of Driver)

	Scenario 1.0					Scenario 00-04				
Age	2005	%	2040	%	Percent Change	2005	%	2040	%	Percent Change
15-24	2,050,510	14.0	3,846,148	10.8	87.6	2,050,510	14.0	3,118,073	10.3	52.1
25-34	2,930,991	20.0	6,619,159	18.5	125.8	2,930,991	20.0	5,452,826	18.0	86.0
35-44	3,072,352	21.0	6,784,172	19.0	120.8	3,072,352	21.0	5,720,546	18.9	86.2
45-54	2,873,377	19.6	6,501,492	18.2	126.3	2,873,377	19.6	5,593,184	18.5	94.7
55-64	1,928,334	13.2	5,317,006	14.9	175.7	1,928,334	13.2	4,661,039	15.4	141.7
65 +	1,803,826	12.3	6,631,945	18.6	267.7	1,803,826	12.3	5,733,620	18.9	217.9
65-74	1,062,251	7.2	3,769,145	10.6	254.8	1,062,251	7.2	3,261,567	10.8	207.0
75-84	600,499	4.1	2,268,879	6.4	277.8	600,499	4.1	1,953,792	6.5	225.4
85+	141,076	1.0	593,921	1.7	321.0	141,076	1.0	518,260	1.7	267.4
Total	***14,659,390***	***100.0***	***35,699,922***	***100.0***	***143.5***	***14,659,390***	***100.0***	***30,279,288***	***100.0***	***106.6***

Source: Derived from Texas Population Estimates and Projections Program; Federal Highway Administration.

Projections of the Number of Drivers (Projected by Race/Ethnicity and Age)

Comparing historical data on driver's licensing rates by age with changes in the racial and ethnic composition of Texas suggests that differences in driving rates between racial and ethnic groups may be influencing declines in the proportion of drivers at younger ages. In order to understand the effects of a changing racial and ethnic composition in Texas, we conducted a separate analysis based upon driving rates by race/ethnicity and age. For this analysis we utilized data from a subset of the 2001 National Household Transportation Survey (Bureau of Transportation Statistics 2004). Rates were calculated by age groups and race/ethnicity. Due to limitations in these data, rates by ten year age groups and race/ethnic categories were estimated for three race/ethnic categories: Anglo, Hispanic, and all Others. These data were first adjusted to obtain rates by race/ethnicity and age using the 2000 Census on population groups. Then these rates were applied to the estimated population by age and race/ethnicity for 2005. These initial estimates of drivers for 2005 were adjusted to match the drivers licensing data by age as reported by FHWA utilizing an iterative proportional fitting model. Finally, these adjusted rates were applied to the population projection scenario which assumes similar migration patterns to those that occurred in the 1990s (Scenario 1.0) and the population projection scenario that assumes similar migrations of that which occurred from 2000 to 2004 (Scenario 00-04).

Under these assumptions, there will be an estimated 29.3 million to 34.6 million Texas drivers by 2040 (Table 3-5). This equates to 668.3 to 672.8 drivers per 1,000 persons and to overall percentage increases of 156.7 percent and 117.8 percent under the two alternative population projection scenarios (compared to 148.0 percent and 109 percent increases in population). Because of differences in licensure rates between Anglo and non-Anglo groups, the number of drivers will increase at a slower pace under these assumptions than what was projected under those projections that assume age and sex specific driver licensing rates. For both population projection scenarios, slightly less than nineteen percent of all drivers will be age sixty-five or older, up from twelve percent in 2005.

Comparing these scenarios, we are able to provide a clearer picture of how the demographic composition of Texas will alter the driving population. According to these estimates, the majority of young drivers (ages 15 to 35) were non-Anglo in 2005 (see Table 3-8). Anglos were the majority of drivers in all other age groups. By 2040, over fifty percent of all drivers will be of Hispanic origin and only in the oldest age group (65 or older) will there be less than a majority of drivers who are Hispanic. A comparison of the scenario using age and sex differentiated rates compared to that using race/ethnicity suggests that larger changes will be induced by changes in age structure and that, in fact, growth in minority populations will tend to reduce rates of growth in the number of drivers. However, since most of the differences in driving rates among racial/ethnic groups appear to be the result of differences in socioeconomic resources, improvements in the socioeconomic resource bases of non-Anglo groups could significantly increase the number of drivers beyond the values projected. (Licensure rates of non-Anglos at the oldest ages are much lower than those of Anglos, thus the largest difference in the numbers of drivers between the two major assumptions [the first projected by sex and age and the second projected by race/ethnicity and age] are particularly evident in the number of drivers 65 and older [Table 3-9]).

Table 3-5:
Population, Number of Drivers, Drivers Per 1,000 Population and Percent Change by Year, 2000-2040 Using Alternative Population Projection Scenarios (Projected by Age and Race/Ethnicity of Driver)

	Population		Drivers		Drivers Per 1,000 Population	
Year	1.0	00-04	1.0	00-04	1.0	00-04
2000	20,851,820	20,851,820	13,462,023	13,462,023	645.6	645.6
2005	22,859,968	22,859,968	14,659,390	14,659,390	641.3	641.3
2010	26,058,565	25,105,646	16,856,250	16,257,220	646.9	647.6
2020	32,736,693	30,252,539	21,410,667	19,859,692	654.0	656.5
2030	41,117,624	36,332,880	27,243,211	24,218,119	662.6	666.6
2040	51,707,500	43,581,928	34,557,328	29,322,108	668.3	672.8

Percent Change by Period

	Population		Drivers		Drivers Per 1,000 Population	
Period	1.0	00-04	1.0	00-04	1.0	00-04
2000-2005	9.6	9.6	8.9	8.9	-0.7	-0.7
2005-2010	14.0	9.8	15.0	10.9	0.9	1.0
2010-2020	25.6	20.5	27.0	22.2	1.1	1.4
2020-2030	25.6	20.1	27.2	21.9	1.3	1.5
2030-2040	25.8	20.0	26.8	21.1	0.9	0.9
2000-2040	148.0	109.0	156.7	117.8	3.5	4.2

Source: U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Highway Statistics Series; U.S.Bureau of the Census; Texas State Data Center Population Estimates and Projections Program.

Table 3-6:
Drivers by Race/Ethnicity and Projection Year 2000-2040 Using Alternative Population Projection Scenarios (Projected by Age and Race/Ethnicity of Driver)

Migration Scenario 1.0

Year	Anglo	%	Hispanic	%	Other	%	Total
2005	8,059,188	55.0	4,551,543	31.0	2,048,659	14.0	14,659,390
2010	8,509,389	50.5	5,889,375	34.9	2,457,486	14.6	16,856,250
2020	8,988,526	42.0	9,093,766	42.5	3,328,374	15.5	21,410,667
2030	9,288,767	34.1	13,538,978	49.7	4,415,466	16.2	27,243,211
2040	9,352,636	27.1	19,443,145	56.3	5,761,547	16.7	34,557,328

Migration Scenario 00-04

Year	Anglo	%	Hispanic	%	Other	%	Total
2005	8,059,188	55.0	4,551,543	31.0	2,048,659	14.0	14,659,390
2010	8,217,049	50.5	5,669,908	34.9	2,370,263	14.6	16,257,220
2020	8,395,230	42.3	8,381,513	42.2	3,082,950	15.5	19,859,692
2030	8,400,188	34.7	11,900,372	49.1	3,917,559	16.2	24,218,119
2040	8,195,040	27.9	16,238,538	55.4	4,888,530	16.7	29,322,108

Source: Derived from Texas Population Estimates and Projections Program; National Household Transportation Survey, 2001

Table 3-7:
Total and Percent of Drivers by Age and Percent Change, 2005-2040 Using Alternative Projection Scenarios
(Projected by Age and Race/Ethnicity of Driver)

	Scenario 1.0					Scenario 00-04				
Age	2005	%	2040	%	Percent Change	2005	%	2040	%	Percent Change
15-24	2,050,510	14.0	3,717,497	10.8	81.3	2,050,510	14.0	3,020,446	10.3	47.3
25-34	2,930,991	20.0	6,569,489	19.0	124.1	2,930,991	20.0	5,413,215	18.5	84.7
35-44	3,072,352	21.0	6,663,034	19.3	116.9	3,072,352	21.0	5,622,336	19.2	83.0
45-54	2,873,377	19.6	6,341,510	18.4	120.7	2,873,377	19.6	5,456,884	18.6	89.9
55-64	1,928,334	13.2	5,186,168	15.0	168.9	1,928,334	13.2	4,545,413	15.5	135.7
65 +	1,803,826	12.3	6,079,630	18.6	237.0	1,803,826	12.3	5,263,814	18.9	191.8
Total	***14,659,390***	***100.0***	***34,557,328***	***100.0***	***135.7***	***14,659,390***	***100.0***	***29,322,108***	***100.0***	***100.0***

Source: Derived from Texas Population Estimates and Projections Program; National Household Transportation Survey, 2001

Table 3-8:
Percent of Drivers by Age and Race/Ethnicity, 2005-2040 Using Alternative Projection Scenarios
(Projected by Age and Race/Ethnicity of Driver)

	2005			2040					
				Scenario 1.0			Scenario 00-04		
Age	Anglo	Hispanic	Other	Anglo	Hispanic	Other	Anglo	Hispanic	Other
15-24	46.1	40.7	13.2	22.1	66.0	11.8	24.5	63.6	11.9
25-34	42.1	43.2	14.7	19.7	66.8	13.5	21.2	65.1	13.7
35-44	50.3	33.6	16.1	21.3	62.8	15.8	22.4	61.9	15.6
45-54	59.1	25.1	15.8	24.4	57.3	18.3	24.6	56.8	18.6
55-64	65.9	21.5	12.6	27.9	53.4	18.7	27.7	53.9	18.5
65 +	75.7	15.6	8.7	46.4	33.1	20.6	46.5	33.5	20.1
Total	***55.0***	***31.0***	***14.0***	***27.1***	***56.3***	***16.7***	***27.9***	***55.4***	***16.7***

Source: Derived from Texas Population Estimates and Projections Program; National Household Transportation Survey, 2001

Table 3-9:
Comparisons of Alternative Projections of Drivers

	Scenario 1.0						Scenario 00-04					
Age	**By Sex**	**%**	**By R/E**	**%**	**Difference**		**By Sex**	**%**	**By R/E**	**%**	**Difference**	
15-24	3,846,148	10.8	3,717,497	10.8	128,651	3%	3,118,073	10.3	3,020,446	10.3	97,626	
25-34	6,619,159	18.5	6,569,489	19.0	49,670	1%	5,452,826	18.0	5,413,215	18.5	39,611	
35-44	6,784,172	19.0	6,663,034	19.3	121,138	2%	5,720,546	18.9	5,622,336	19.2	98,210	
45-54	6,501,492	18.2	6,341,510	18.4	159,982	2%	5,593,184	18.5	5,456,884	18.6	136,301	
55-64	5,317,006	14.9	5,186,168	15.0	130,838	2%	4,661,039	15.4	4,545,413	15.5	115,626	
65 +	6,631,945	12.3	6,079,630	18.6	552,315	8%	5,733,620	12.3	5,263,814	18.9	469,806	
Total	***35,699,922***	***100.0***	***34,557,328***	***100.0***	***1,142,594***	*3%*	***30,279,288***	***100.0***	***29,322,108***	***100.0***	***957,180***	

Source: Derived from Texas Population Estimates and Projections Program; Federal Highway Administration; National Household Transportation Survey, 2001

Effects of Changes in the Composition and Growth in Drivers on Total Daily VMT

Changes in the number and characteristics of licensed drivers in Texas have direct impacts on transportation demand. Vehicle miles of travel vary by age, sex, and race/ethnicity; therefore changes in the characteristics of Texas drivers will impact overall travel demand. Like income, average VMT typically increases with age into the 40s and 50s, then declines as people enter into and through the retirement ages. Like rates for driver's licensing, average VMT for Anglos is higher than it is for other groups. In order to understand the impacts of the changes in the number and demographic composition of Texas drivers, we applied the average vehicle miles of travel (VMT) obtained from the National Household Transportation Survey (2001) to our alternative projections of drivers to obtain total VMT per year. Although other models projecting VMT are often utilized for local areas and shorter time periods, this method of projecting vehicle miles of travel has been implemented by others for long term forecasts and scenario planning of travel demand (Polzin 2006; Greene et al. 1995; Lave 1991; Green 1987; and Maring 1974). We cannot predict how technological, land use and behavioral changes will affect how much people drive; however, these projections allow us to understand the effects of demographic change on travel demand.

As shown in Table 3-10, the combined effects of the differences in licensing by age, sex and race/ethnicity and differences in average VMT will affect future demand. Under these assumptions, aggregate VMT will increase from approximately 183.7 billion in 2005 to from 329.0 and 456.1 billion by 2040, an increase of between 79.1 and 148.4 percent over 2005. Like changes in licensed drivers, increases in the numbers and proportion of adults will help increase total demand for transportation as measured in VMT. At the same time, when race/ethnicity is taken into account, total VMT grows more slowly. In fact, while the percentage growth in the number of drivers between 2005 and 2040 is larger than the percentage growth in total population, this is not the case for change in total VMT using race/ethnicity and age specific rates as compared to the analysis that uses age, and sex specific rates only (see Figure 3-3).

Although the growth in aggregate VMT is substantial, on a daily, per driver basis, vehicle miles change only slightly from the estimated 34.3 vehicle miles per day per driver in 2005. In the scenarios that utilized licensure rates and average VMT by age and sex of driver, daily vehicle miles increase to just 34.9 miles per driver by 2040 (due primarily to increases in the proportions of drivers at the oldest ages with lower average daily VMT). When licensure rates and average VMT by race and ethnicity are factored into the projections, daily vehicle miles declines to around 30 miles per driver per day by 2040. The changes in aggregate VMT suggest that total population growth will play an important role in increasing overall VMT while changes in the characteristics of the population will tend to reduce growth in VMT unless there are changes in travel behaviors (i.e. increases in average VMT for all ages and race/ethnicities but especially the elderly and non-Anglos).

Table 3-10:
Comparison of the Effects of Alternative Projections of Drivers upon Daily Vehicle Miles of Travel (Billions of VMT) Using Alternative Assumptions

Year	By Sex	By R/E	Difference	Year	By Sex	By R/E	Difference
Migration Scenario 1.0				**Migration Scenario 00-04**			
2005	183.7	183.7	0.0	2005	183.7	183.7	0.0
2010	218.6	208.1	10.5	2010	211.1	200.9	10.2
2020	278.3	254.1	24.2	2020	258.5	236.0	22.5
2030	356.3	312.1	44.2	2030	317.1	277.8	39.3
2040	456.1	387.3	68.8	2040	386.9	329.0	57.9
Percent Change by Period							
Migration Scenario 1.0				**Migration Scenario 00-04**			
2005-10	19.0%	13.3%		2005-10	14.9%	9.4%	
2010-20	27.3%	22.1%		2010-20	22.4%	17.5%	
2020-30	28.0%	22.8%		2020-30	22.7%	17.7%	
2030-40	28.0%	24.1%		2030-40	22.0%	18.4%	
2005-40	148.4%	110.9%		2005-40	110.6%	79.1%	

Source: Derived from Texas Population Estimates and Projections Program; National Household Transportation Survey, 2001

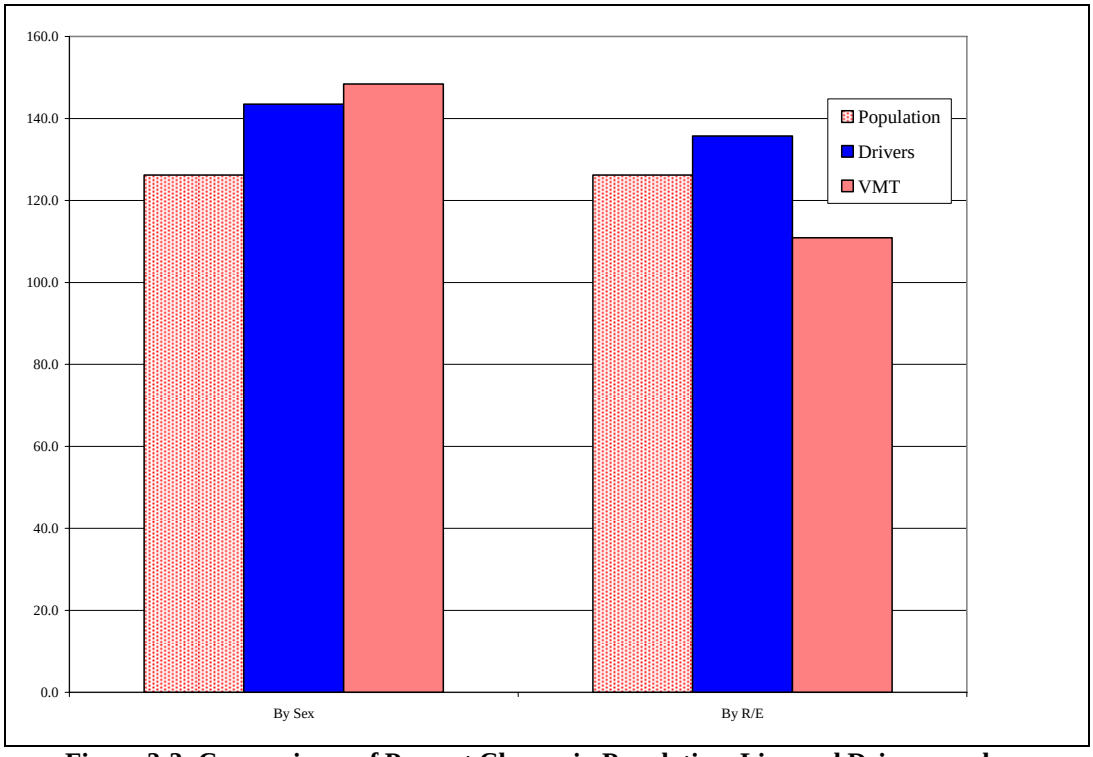

Figure 3-3: Comparisons of Percent Change in Population, Licensed Drivers, and Total Vehicle Miles of Travel, 2000-2040, for the Alternate Projection of Drivers (by Sex and Age, and Race/Ethnicity and Age) and Total VMT

Implications for Vehicular Crashes

Changes in the demographic composition of the driving population will not only affect transportation demand, but will also have implications for traffic safety. Crash rates for drivers typically decline with age and men, on average, are involved in more traffic crashes then women (Figure 3-4). With more people driving, we expect increases in the number of traffic crashes. However, given trends in the age composition of the Texas population, the rates of change may slow compared to those experienced in the past. We extend our analysis of the effects of population change on the driving population to understand how these changes may effect changes in the number of motor vehicle related crashes. We assume that the rates for the number of drivers involved in crashes for 2005 remain the same throughout the projection period. We recognize that changes in public policy, driver behaviors, transportation technologies, and other factors may play a more significant role than demographic factors in changing the number and severity of traffic crashes. The following data include information on the number of drivers involved in crashes by crash severity. Because traffic accidents may involve more than one driver, these numbers will be larger than the total number of singular incidents. In addition, these data do not include the total number of people killed or injured in crashes. For our analysis of the number of drivers involved in crashes, we utilize the scenarios which project the number of drivers based upon the sex and age for two sets of population projection scenarios: one that assumes similar rates of net migration as those experienced during the 1990s (the 1.0 scenario), and another which assumes similar rates of net migration as those experienced between 2000 and 2004 (the 00-04 scenario).

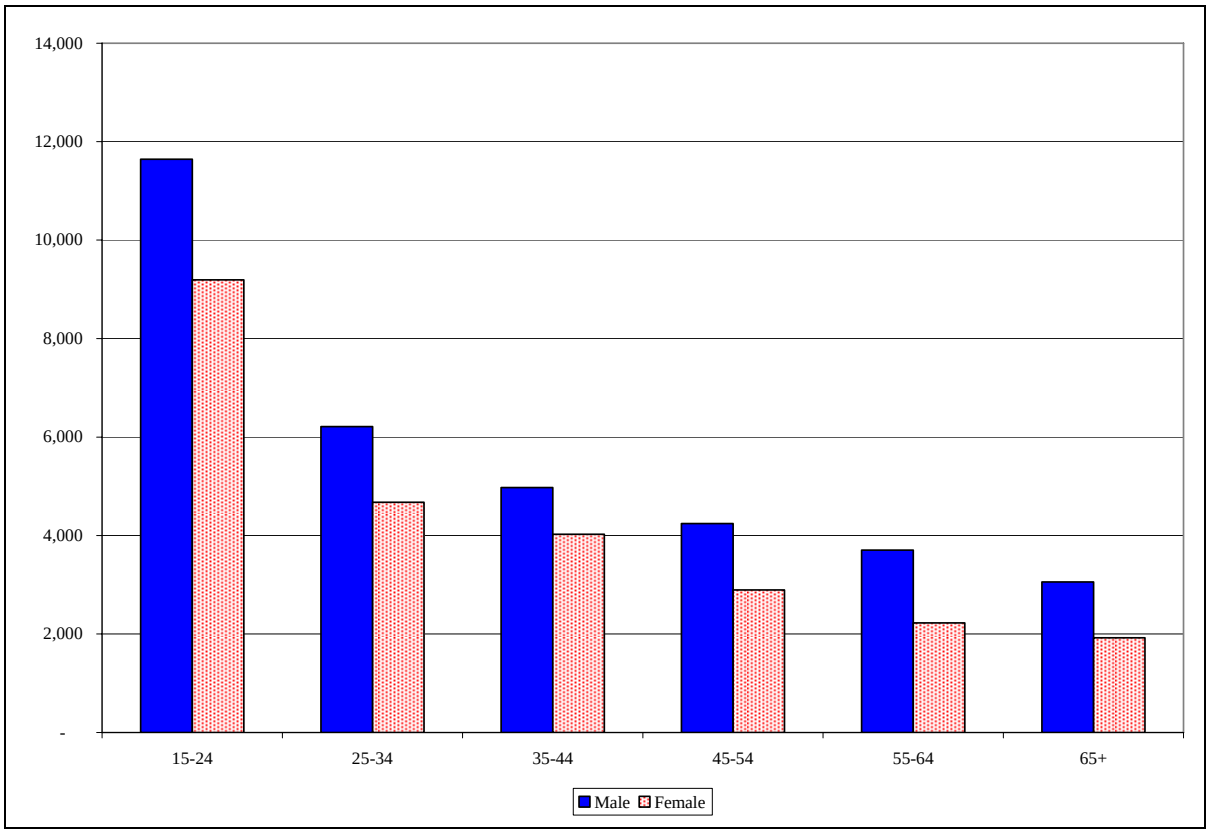

Figure 3-4: Crash Involvement Rates per 100,000 Licensed Drivers for Texas by Age and Sex, 2005

We obtained data on the number of drivers involved in crashes for 2005 by age and sex of the driver from the Texas Department of Public Safety. These data were merged with the Federal Highway Administration data on licensed drivers by age and sex for 2005 and crash rates were calculated based upon these two data sets. The rates were calculated for the number of drivers involved in fatality, injury, and non-injury crashes. The denominator for our rates are the number of licensed drivers, thus our projections for the total number of incidents are likely to be conservative because crashes for unlicensed drivers less than age 15 are not included. In addition, we do not include the incidents where the information about either a driver's age or sex was not included.

Under these assumptions, the total number of drivers involved in crashes will be between 1.4 and 1.6 million in 2040, a 91 to 127 percent increase in the number of drivers involved in crashes in 2005 (Table 3-11). Because of the age composition of the driving population, this increase will not be as fast as that for the total population or the total number of drivers. Under similar assumptions, the number of drivers will increase by 107 to 144 percent during the same period. The differences in the percentage increase in the number of crashes and the total number of drivers reflects the changes in the proportion of drivers by age – with smaller increases in the number of drivers in the younger ages where crash rates are high.

Table 3-11:
Total Drivers Involved in Crashes, 2005-2040 by Projection Scenario and Severity of Crash

	Fatality		Injury		Non-Injury		Total	
Year	**1.0**	**00-04**	**1.0**	**00-04**	**1.0**	**00-04**	**1.0**	**00-04**
2005	4,622	4,622	272,323	272,323	439,892	439,892	716,837	716,837
2010	5,321	5,119	311,636	299,585	503,569	483,973	820,526	788,677
2020	6,741	6,221	388,921	358,491	629,224	580,019	1,024,886	944,731
2030	8,636	7,629	492,953	434,462	798,780	704,058	1,300,369	1,146,149
2040	10,952	9,216	617,287	517,629	1,000,825	839,419	1,629,064	1,366,264
	Percent Change by Period							
	Fatality		**Injury**		**Non-Injury**		**Total**	
Period	**1.0**	**00-04**	**1.0**	**00-04**	**1.0**	**00-04**	**1.0**	**00-04**
2005-2010	15.1	10.8	14.4	10.0	14.5	10.0	14.5	10.0
2010-2020	26.7	21.5	24.8	19.7	25.0	19.8	24.9	19.8
2020-2030	28.1	22.6	26.7	21.2	26.9	21.4	26.9	21.3
2030-2040	26.8	20.8	25.2	19.1	25.3	19.2	25.3	19.2
2005-2040	137.0	99.4	126.7	90.1	127.5	90.8	127.3	90.6

Source: Derived from Texas Department of Public Safety; Federal Highway Administration; Texas State Data Center Population Estimates and Projections Program.

The effects of an aging population can be seen in the changes in the number of drivers involved in injury and fatality crashes. According to these assumptions, the percentage growth in incidents for those aged 65 and older will surpass the percent change in the number of drivers. From 2005 to 2040, the number of drivers 65 and older will increase by between 218 and 268 percent while the percentage change in the number of drivers in these same age groups involved in fatality crashes will increase by between 231 and 285 percent and the number involved in injury crashes will increase by between 223 and 275 percent. In addition, the proportion of driver involvement in fatality crashes attributed to those 65 and older will increase significantly from 9 to 14 percent (Table 3-12).

Table 3-12:
Total Drivers and Drivers Involved in Injury and Fatality Crashes by Age for 2005 and Projected to 2040 by Projection Scenario

Drivers

			Scenario 1.0			Scenario 00-04		
Age	**2005**	**%**	**2040**	**%**	**Percent Change**	**2040**	**%**	**Percent Change**
15-24	2,050,510	14.0	3,846,148	10.8	87.6	3,118,073	10.3	52.1
25-34	2,930,991	20.0	6,619,159	18.5	125.8	5,452,826	18.0	86.0
35-44	3,072,352	21.0	6,784,172	19.0	120.8	5,720,546	18.9	86.2
45-54	2,873,377	19.6	6,501,492	18.2	126.3	5,593,184	18.5	94.7
55-64	1,928,334	13.2	5,317,006	14.9	175.7	4,661,039	15.4	141.7
65 +	1,803,826	12.3	6,631,945	18.6	267.7	5,733,620	18.9	217.9
Total	***14,659,390***	***100.0***	***35,699,922***	***100.0***	***143.5***	***30,279,288***	***100.0***	***106.6***

Injury Accidents

			Scenario 1.0			Scenario 00-04		
Age	**2005**	**%**	**2040**	**%**	**Percent Change**	**2040**	**%**	**Percent Change**
15-24	80,246	29.5	149,202	24.2	85.9	120,930	23.4	50.7
25-34	61,921	22.7	139,993	22.7	126.1	115,253	22.3	86.1
35-44	53,284	19.6	118,290	19.2	122.0	99,774	19.3	87.2
45-54	39,159	14.4	89,242	14.5	127.9	76,745	14.8	96.0
55-64	21,616	7.9	60,259	9.8	178.8	52,874	10.2	144.6
65 +	16,097	5.9	60,301	9.8	274.6	52,053	10.1	223.4
Total	***272,323***	***100.0***	***617,287***	***100.0***	***126.7***	***517,629***	***100.0***	***90.1***

Fatality Accidents

			Scenario 1.0			Scenario 00-04		
Age	**2005**	**%**	**2040**	**%**	**Percent Change**	**2040**	**%**	**Percent Change**
15-24	1,177	25.5	2,192	20.0	86.2	1,773	19.2	50.6
25-34	1,032	22.3	2,362	21.6	128.9	1,945	21.1	88.5
35-44	869	18.8	1,963	17.9	125.9	1,657	18.0	90.7
45-54	696	15.1	1,616	14.8	132.2	1,390	15.1	99.7
55-64	448	9.7	1,282	11.7	186.2	1,128	12.2	151.8
65 +	400	8.7	1,537	14.0	284.3	1,323	14.4	230.8
Total	***4,622***	***100.0***	***10,952***	***100.0***	***137.0***	***9,216***	***100.0***	***99.4***

Source: Derived from Texas Populalation Estimates and Projections Program; Texas Department of Public Safety; Federal Highway Administration

Conclusion

Due to sheer population growth, the number of Texas drivers will increase substantially over the next 35 years from 15 million to between an unprecedented 30 million and 35 million licensed drivers in Texas by 2040 under these projection scenarios. This is more than the combined total number of licensed drivers living in Texas and New York in 2005 (26 million licensed drivers). On a percentage basis, due to changes in the age structure of the population, an unprecedented 67 to 69 percent of the total population will be licensed to drive by 2040 – up from approximately 64 percent in 2005. The consequences of this growth, along with changes in the demographic characteristics of these drivers will have decidedly far ranging impacts on travel demand (as measured in VMT) and on traffic accidents and fatalities. We provide a summary of some of these potential impacts below:

1. ***Extensive increases in the number and proportions of elderly drivers.*** As the baby-boom generation enters retirement ages, these cohorts will substantially increase the number and percentage of all drivers who are elderly. In 2005, 12 percent of all drivers were 65 years of age or older, by 2040, this percentage will increase to around 19 percent. This change is accentuated in the category of the oldest old – those 85 years and older, where the number of drivers will increase from 141,000 in 2005 to over 500,000 by 2040 (by between 267 and 321 percent change depending upon population projection scenario). Furthermore, since the women in these cohorts entering these ages have higher licensure rates than those of previous generations of women, this growth may be even larger than that projected here. The effect of an aging population may impact the number of traffic accidents and fatalities, influence transportation service delivery, and increase off-peak (non-commuting) travel demand.

2. ***Increases in the number and percentage of non-Anglo drivers.*** Due to population growth differentials, non-Anglo drivers will account for over 70 percent of all drivers by 2040 (compared to 45 percent in 2005). However, the growth in the number of non-Anglo drivers will not be as much as expected given total population growth of these same groups since current licensure rates are below those of Anglos. Should the differentials in licensing between Anglos and non-Anglos close (i.e. all race/ethnic groups have the same licensing rates as Anglos did in 2005), this growth could be even larger.

3. ***Increased travel demand (as measured in VMT).*** Increases in the number of drivers will impact travel demand by increasing vehicle miles of travel by over 100 percent from 2005 to 2040. Aggregate VMT generated by Texas drivers will increase from an estimated 185 billion in 2005 to from 329 and 456 billion by 2040. The effect of newer generations of women with higher licensure rates in combination with increased licensure and driving rates of non-Anglos could increase these figures even higher.

4. ***Increases in the number of drivers involved in crashes.*** The number of drivers involved in crashes will increase by between 90 and 125 percent from 2005 to 2040. While this is a substantial increase, this change is lower than the overall change in the number of drivers and the population – a consequence of differentials in growth between older and younger ages [i.e. the growth in the number of younger drivers (when most crashes occur) will be slower than the growth in the number of older drivers]. Similarly, the percentage growth in driver accidents will be fastest in the ages 65 and older. Fatality crashes where elderly drivers are involved will increase by between 231 and 285 percent and injury crashes by between 223 and 275 percent. These rates are higher than that of

the increase in the number of drivers in these ages (from between 218 and 268 percent change depending upon projection scenario).

5. ***Increases in the number of people without drivers licenses.*** Finally, while this chapter has looked at transportation demand from the standpoint of the number of drivers in order to understand the needs for expanded roadway infrastructure, these trends also have implications for demand for other forms of transportation services. While the majority of Texans will likely continue to drive, by 2040, approximately 7.9 million adults will not drive under the scenario which assumes migration patterns similar to the 1990s and the same drivers' licensing rates by age and race/ethnicity. This is a 162 percent increase in the number of non-drivers over the number in 2005. Even under the same population projection scenario and assumptions of drivers' licensure rates by age and sex, 5.7 million adults will not be able to drive in 2040. With the exception of the institutionalized, most of these adults will depend on others, including public transportation in order to meet their mobility needs.

Chapter 4

Commuting Trends and Population Change and the Implications for Inter-County Commuting

Knowledge of population change is clearly of significance for anticipating the transportation infrastructure needs of Texas population. Knowing the overall level of infrastructure needs, although important, is insufficient, however, if one does not know where such needs are likely to be located geographically. Information on the distribution of the population is therefore equally critical. In the study of transportation this distribution interacts with commuting patterns of workers such that understanding patterns of population distribution in conjunction with trends in commuting become critical. It is such interrelationships that are delineated in this chapter.

A variety of improvements in transportation infrastructure and technology during the twentieth century lessened the relative cost of a daily commute and enabled individuals to live and work in areas separated by many miles. Over time, the proportion of commuters working and living within the same county has declined as individuals have extended the distances they are willing and able to travel for jobs and as development from metropolitan central cities extended into suburban and exurban areas. At 27 percent, the journey-to-work accounted for the largest percentage of daily vehicle miles traveled nationally in 2001 (Bureau of Transportation Statistics 2004, Pisarski 2006). Therefore, changes in the number of commuters and where they live and work can inform our understanding of changes in transportation demand. During the 1990s, the population of Texas grew by 19.4 percent to a total of 20.9 million people by 2000, while at the same time the number of individuals working in Texas increased by 20.4 percent to a total of 9.2 million people (Table 4-1). Most of these people lived and worked in metropolitan areas, where 85.8 percent of all workers lived and 87.3 percent of all jobs were located (see Tables 4-1 and 4-2). Metropolitan areas added 3.5 million people, 1.4 million workers, and 1.5 million jobs during the 1990s and continue to dominate growth in all areas. Should these trends continue, significantly more workers will be commuting within and to metropolitan areas in the coming decades. Even in non-metropolitan areas, the number of people leaving their resident community for work elsewhere has increased over time as communities have become more economically interdependent. A continuation of these trends in commuting along with continued development of suburban areas will have profound impacts on the demand for transportation infrastructure, traffic congestion and air quality.

In this chapter we summarize trends in inter-county and intra-metropolitan commuting based upon information derived from the Census Transportation Planning Package (CTPP). Despite some limitations, the CTPP provides a reasonable estimation of where people lived and worked during 2000, as the data provide a snapshot of where people lived and worked on the week prior to completing the Census survey. In a work of this scope it would be difficult to discuss changes in all combinations of county-to-county commuter journeys-to-work, therefore, in order to provide some context and ease interpretation, we utilize the same metropolitan and metropolitan adjacency classifications that were presented in Chapter 1 and follow this discussion by highlighting the largest county-to-county commuter flows in 2000. We further classify metropolitan counties according to the size of the metropolitan area. Counties located within MSAs over 1 million in population are categorized as “large” while all others are MSA counties are considered small. After our summary of the changes in these inter-county journeys-to-work, we provide an overview of the potential changes in these commuter flows should the rates of commuting from origin counties to destination counties continue into the future assuming alternative labor force projection scenarios. While the overview of historical changes includes some indication of the changes in commuting from and to other states, we are limited by our data to incorporate these out-of-state origin and destinations of commuters in our projections. Statewide, these account for less than 1 percent of the commuting flows into or out of

the State although these may be more important to individual counties and metropolitan areas that are adjacent to other states. Unlike data from other sources, in the information presented here, the number of workers refers to the number of people who worked for pay, whether or not they were self-employed, employed by others, or served in the military. In our discussion, we use the terms "workers" and "commuters" interchangeably as terms referring to the number of people who are leaving home (origin) to work at a place of business (destination). We use the term "jobs" in order to refer to the place of business (destination) for these workers.

Table 4-1:
Commuters by Residence Location by Year, and
Numeric and Percent Change, 1990-2000

	1990		2000		1990-2000 Change	
Residence County Type	**No.**	**%**	**No.**	**%**	**Num.**	**%**
Large Metro	4,816,839	62.7	5,957,387	64.4	1,140,548	23.7
Central City	3,808,238	49.6	4,410,716	47.7	602,478	15.8
Suburban	1,008,601	13.1	1,546,671	16.7	538,070	53.3
Small Metro	1,719,520	22.4	1,980,839	21.4	261,319	15.2
Central City	1,535,028	20.0	1,767,014	19.1	231,986	15.1
Suburban	184,492	2.4	213,825	2.3	29,333	15.9
Non-Metro Adjacent	743,838	9.7	860,647	9.3	116,809	15.7
Non-Metro Non-Adjacent	330,290	4.3	359,834	3.9	29,544	8.9
Out of State	69,766	0.9	89,346	1.0	19,580	28.1
Total Commuters	***7,680,253***	***100.0***	***9,248,053***	***100.0***	***1,567,800***	***20.4***

Source: Census2000 CTPP-3 & 1990 Journey-to-Work. See text for definitions.

Table 4-2:
Commuters by Work Location by Year, and
Numeric and Percent Change, 1990-2000

	1990		2000		1990-2000 Change	
Work Location County Type	**No.**	**%**	**No.**	**%**	**Num.**	**%**
Large Metro	4,865,338	63.3	6,052,142	65.4	1,186,804	24.4
Central City	4,218,719	54.9	4,994,538	54.0	775,819	18.4
Suburban	646,619	8.4	1,057,604	11.4	410,985	63.6
Small Metro	1,745,092	22.7	2,021,646	21.9	276,554	15.8
Central City	1,622,482	21.1	1,884,720	20.4	262,238	16.2
Suburban	122,610	1.6	136,926	1.5	14,316	11.7
Non-Metro Adjacent	670,404	8.7	724,251	7.8	53,847	8.0
Non-Metro Non-Adjacent	331,990	4.3	359,446	3.9	27,456	8.3
Out of State	67,429	0.9	90,568	1.0	23,139	34.3
Total Commuters	***7,680,253***	***100.0***	***9,248,053***	***100.0***	***1,567,800***	***20.4***

Source: Census2000 CTPP-3 & 1990 Journey-to-Work. See text for definitions.

Note: Tables include data for commuters commuting to and from other counties outside of Texas.

Between 1990 and 2000, the number of people working in metropolitan areas grew by 6.6 million, accounting for 93.3 percent of the total change in the number of people working in Texas. This growth was not limited to the largest metropolitan statistical areas (MSAs), as both large and small metropolitan areas saw their growth outpace growth in non-metropolitan areas in percentage and numeric terms.[2] Between 1990 and 2000, over 1.2 million jobs were added to large metropolitan areas, a 24.4% increase over 1990 while small metropolitan areas added 15.8% more jobs over 1990 (see Table 4-2). Most jobs continue to be located within central cities of metropolitan areas. In 2000, over half of all jobs were located in the large metropolitan central city counties of Bexar, Dallas, Galveston, Harris, Tarrant, and Travis. Slightly less than half of all commuters lived within these same counties. While most people continue to live and/or work in metropolitan central city counties, the most striking changes in commuters occurred in large metropolitan suburban counties. In 1990, 1.0 million workers lived in large metropolitan suburban counties but by 2000 that number had increased by 53.3 percent to 1.5 million. Furthermore, the numeric change was only slightly less than the number of workers added to large metropolitan central city counties. Similarly, while over 54.0 percent of all employees worked in large metropolitan central city counties in 2000, the growth in the number of people working in large metropolitan suburban counties increased significantly from 1990 to 2000. Between 1990 and 2000, there was a 63.6 percent change in the number of people working in large metropolitan suburban counties. This was a numeric change of 410,985. This was a little more than half the change in the number of workers working in central city counties of large metropolitan areas (an increase of 775,819 jobs or 18.4 percent change).

Origins and Destinations of Metropolitan Workers

While 78.6 percent of all workers live and work within their county of residence, the percentage of commuters leaving their home county differs according to county types. Central city county commuters are more likely to commute to work within their same county than commuters from any other type of county. In 2000, over 88.5 percent of large metropolitan central city county workers and 91.3 percent of small metropolitan central city workers lived and worked within the same county (see Table 4-3). Again, this indicates that most employment opportunities are located within metropolitan central city counties. Only in suburban counties do the majority of workers commute outside of their residence county for work. In 2000, at least 45.5 percent of all commuters who lived in a metropolitan suburban county worked within the same county. Of those commuters leaving their residence county, most were commuting from the suburban county to a central city county within the metropolitan area. Less than five percent of all suburban commuters were commuting to another suburban county. Still, while this commuting flow remains small in comparison to suburban to central county flows, the growth in large metropolitan suburban county to suburban county commuting increased by 117.3 percent between 1990 and 2000 (Table 4-4).

[2] For this analysis, the large MSAs include Austin, Dallas, Fort Worth, Galveston, Houston and San Antonio while all other MSAs are categorized as small.

Table 4-3:
Origin and Destination of Commuters by County Type in 2000 by Percent of Commuters from Origin to Destination County Type

Residence County (Origin)	Percent of Commuters to Work County (Destination)								Total Commuters	
		Same MSA		Other MSA		Non-Metro				
	Same County	Central City County	Suburban County	Central City County	Suburban County	Adjacent	Non-Adjacent	Out of State	Num.	%
Large Metro	77.6	15.8	4.5	0.7	0.2	0.5	0.1	0.7	5,957,387	65.0
Central City	88.5	5.3	4.6	0.5	0.1	0.3	0.1	0.6	4,410,716	48.2
Suburban	46.5	45.6	4.1	1.2	0.5	1.1	0.2	0.8	1,546,671	16.9
Small Metro	86.4	3.8	0.8	3.8	1.1	2.1	0.2	1.8	1,980,839	21.6
Central City	91.3	0.5	0.8	2.3	1.1	1.9	0.2	1.8	1,767,014	19.3
Suburban	45.5	30.9	0.7	16.4	0.5	3.3	0.4	2.2	213,825	2.3
Non-Metro Adjacent	66.6			17.1	6.0	6.4	2.8	1.2	860,647	9.4
Non-Metro Non-Adjacer	82.6			3.4	0.8	5.7	5.9	1.6	359,838	3.9
Total Commuters	***78.6***	***11.1***	***3.1***	***3.0***	***1.0***	***1.6***	***0.6***	***1.0***	***9,158,711***	***100.0***

Source: Census2000 CTPP-3 & 1990 Journey-to-Work. See text for definitions.

Table 4-4:
Change in Intra-Metropolitan Commuter Flows, 1990-2000

	Large MSA		Small MSA	
Destination County	**Num.**	**%**	**Num.**	**%**
Central City County to Central City County	49,084	26.7	2,738	39.6
Central City County to Suburban County	108,113	112.8	2,488	20.5
Suburban County to Central City County	249,967	54.8	14,189	27.3
Suburban County to Suburban County	33,906	117.3	452	44.0

Source: Derived from Census2000 CTPP-3 & 1990 Journey-to-Work. See text for definitions.

A review of specific county to county commuter flows helps explain the increasing importance of transportation in matching employers to employees and the increased development of suburban areas. Table 4-5 shows commuting flows from origin county to destination county for all commuter flows of at least 10,000 commuters in 2000 along with their comparative figures for 1990. In 2000, there were at least 30 county-to-county commuter flows with at least 10,000 commuters, compared to only 18 in 1990. Again, most of the largest commuting flows are from suburban to central city county; however, the growth in counter-flows from central city county to suburban county can be seen in these data. In 1990, there were only two commuter flows of 10,000 or more from a central city county to a suburban county, by 2000, there were five commuter flows. Of these flows, the commuting flow between Travis and Williamson Counties showed the largest percentage change between 1990 and 2000. By 2000, an additional 24,645 people were commuting from Travis to Williamson County, a 283.9 percent increase over 1990. This was almost as large as the increase in the number of people commuting between Dallas and Collin County, with an additional 25,478 commuters added during the same period (113.2 percent increase). Of the top 30 county-to-county commuting flows, only one represents a flow between two suburban counties (as defined here). In 2000, almost 15,000 commuters were leaving Denton County to work in Collin County a 145.4 percent increase over the approximately 6,000 commuters in 1990.

Table 4-5:
Top 30 Inter-County Commuter Flows of 10,000 or More in 2000 and Comparison with 1990

Rank				Total Commuters		Change	
2000	1990	Origin	Destination	2000	1990	Num.	%
1	1	Tarrant	Dallas	136,090	104,418	31,672	30.3
2	2	Collin	Dallas	119,210	71,044	48,166	67.8
3	3	Fort Bend	Harris	97,675	67,372	30,303	45.0
4	4	Denton	Dallas	95,365	66,720	28,645	42.9
5	6	Williamson	Travis	66,755	39,687	27,068	68.2
6	7	Montgomery	Harris	58,325	36,769	21,556	58.6
7	10	Dallas	Collin	47,980	22,502	25,478	113.2
8	5	Dallas	Tarrant	46,430	43,019	3,411	7.9
9	8	Galveston	Harris	36,970	26,987	9,983	37.0
10	13	Brazoria	Harris	33,960	17,533	16,427	93.7
11	12	Harris	Fort Bend	32,100	17,533	14,567	83.1
12	9	Randall	Potter	30,045	26,408	3,637	13.8
13	11	Johnson	Tarrant	25,365	18,678	6,687	35.8
14	29	Travis	Williamson	24,645	6,420	18,225	283.9
15	15	Ellis	Dallas	21,385	15,574	5,811	37.3
16	14	Coryell	Bell	20,625	16,418	4,207	25.6
17	16	Parker	Tarrant	19,990	15,106	4,884	32.3
18	17	Hays	Travis	19,885	10,504	9,381	89.3
19	24	Harris	Montgomery	18,225	7,683	10,542	137.2
20	20	Denton	Tarrant	15,810	9,424	6,386	67.8
21	19	Kaufman	Dallas	15,465	9,655	5,810	60.2
22	30	Denton	Collin	14,895	6,070	8,825	145.4
23	22	Guadalupe	Bexar	13,400	8,765	4,635	52.9
24	35	Dallas	Denton	13,260	5,610	7,650	136.4
25	23	Bastrop	Travis	13,255	7,948	5,307	66.8
26	21	Harris	Galveston	13,150	9,135	4,015	44.0
27	18	Orange	Jefferson	12,675	10,391	2,284	22.0
28	31	Comal	Bexar	11,390	6,012	5,378	89.5
29	27	Rockwall	Dallas	10,790	7,380	3,410	46.2
30	34	Donna Anna, NM	El Paso	10,445	5,781	4,664	80.7

Source: Census2000 CTPP-3 & 1990 Journey-to-Work.

Non-Metropolitan Commuting

Growth in county-to-county commuting is not limited to metropolitan areas. Increases in the number and proportion of commuters leaving their home county for work can be found for all county types. The primacy of metropolitan areas for job opportunities can be seen in the commuting flows from non-metropolitan areas and the number of workers leaving their home county according to metropolitan adjacency. Those non-metropolitan counties not adjacent to metropolitan areas have the second highest proportion of commuters working within the same county. In 2000, 82.6 percent of the commuters in these counties lived and worked within the same county (see Table 4-3). In contrast, commuters who lived in non-metropolitan counties adjacent to metropolitan areas were less likely to work within the same county (66.6 percent). Because job opportunities are available in nearby metropolitan areas, many of these commuters were traveling to central cities or suburban counties. Some may have moved from metropolitan areas in search of a "rural lifestyle" while others may find that jobs in nearby areas are readily accessible via the transportation network. For the largest metropolitan areas, these counties are adjacent to suburban counties and might be considered "exurban", while for many of the smaller metropolitan areas, these counties are adjacent to the central counties of the metropolitan areas and thus might be close enough to the central cities to be considered "suburban." Between 1990 and 2000, an additional 51,477 people were commuting from non-metropolitan adjacent counties to central city counties, the largest numeric increase in commuters for this county type (Table 4-6). Interestingly, the largest percentage increases in the number of commuters from both non-metropolitan adjacent and non-adjacent counties were the commuting flows to suburban counties. Non-metropolitan adjacent counties saw a 90.7 percent increase in the number of people commuting to suburban counties while non-metropolitan adjacent counties saw an increase of 69.4 percent. Continued suburban development may make more jobs accessible to non-metropolitan residents and thus increase non-metropolitan to metropolitan commuting.

Table 4-6:
Change in Non-Metropolitan Commuting Destinations by Metropolitan Adjacency Status, 1990-2000

	Adjacent		Non-Adjacent	
Destination County	**Num.**	**%**	**Num.**	**%**
To Central City County	51,477	53.7	4,208	51.7
To Suburban County	21,233	69.4	1,373	90.7
To Non-Metro Adjacent County	13,675	33.2	7,068	52.6
To Non-Metro Non-Adjacent County	7,068	34.8	5,114	34.8

Source: Derived from Census2000 CTPP-3 & 1990 Journey-to-Work. See text for definitions.

Effects of Population Change on Origin and Destination of Workers

Future population growth in metropolitan and, in particular, suburban counties will place significant burdens on the development of new transportation infrastructure. Should workers continue to commute outside of their home counties as they have in the past, then the number of workers commuting will increase significantly. In order to understand the potential impacts of population growth on commuting, we prepared a series of projections of the journey-to-work to 2040. The Texas State Data Center projects the total civilian labor force for Texas based upon labor force participation ratios in 2000 for combinations of each age, sex and race/ethnicity which are applied to the different population projection scenarios that were described in Chapter 1. In order to estimate future commuter flows, we first calculated the ratio of workers to the labor force in 2000 that were commuting to each destination county from a county of origin. These ratios were then applied to future projections of the labor force by county (these projections for the State are described and shown in Chapter 7, Table 7-2 through 7-5). These projections of commuting assume the same percentage of workers will commute from their county of origin as was indicated in data for 2000. Realistically, change in transportation costs, and economic and residential development will influence land uses and alter the commuting flows from those for 2000 assumed here to continue to 2040. Nevertheless, this provides an exemplary overview of what changes may occur should current development continue. We present the results of these projections for the year 2040 for the two population projection scenarios and compare these data to the commuting flows in 2000.

The number of commuters in Texas will increase from 9.2 million in 2000 to between 18.8 and 22.2 million in 2040. In other words, the increase in the number of commuters using even the moderate labor force projection scenario will be more than the total number of commuters in Texas in 2000 (see Table 4-7). Under the Scenario 1.0 assumptions, the total number of commuters will increase by over 142 percent from the number in 2000. Regardless of population projection scenario employed, large metropolitan suburban counties will see the largest numeric and percentage growth in workers residing within their respective counties so that by 2040 more than 30 percent of all commuters will live in these counties (see Table 4-7). Under both scenarios, more than 5.0 million people will be added to these large metropolitan suburban counties, a change of more than 350 percent. The post 2000 period has seen significant growth in these suburban counties. Thus, if the post-2000 trends continue, there will be a larger differential between growth in large metropolitan central city and suburban counties. Under the 00-04 population projection scenario, 5.5 million workers will be added to large metropolitan suburban counties – compared to just 2.9 million added to central city counties of these same large metropolitan areas. Under both scenarios, all county classifications will see growth in the number of workers residing within their respective counties with the largest change occurring in metropolitan counties. In both cases, by 2040, less than 8 percent of all workers will live in non-metropolitan counties, down from 13.3 percent in 2000.

Should these workers continue to commute within and to other counties at the same rates that they did in 2000, the majority of Texas workers will continue to work in large metropolitan central city counties (Table 4-8). However, similar to the growth in the number of workers living in large metropolitan suburban counties, the largest percentage growth in jobs will occur in large metropolitan suburban counties (Table 4-8). Overall, approximately 93 percent of all jobs will be located in metropolitan areas under these assumptions, up from 88.2 percent of all jobs in 2000.

Table 4-7:
Commuters by Residence Location by Year, and Numeric and Percent Change, 2000-2040 for Alternative Population Projection Scenarios

	Scenario 1.0					
	2000		2040		2000-2040 Change	
Residence County Type	No.	%	No.	%	Num.	%
Large Metro	5,957,387	65.0	16,518,064	74.5	10,560,677	177.3
Central City	4,410,716	48.2	9,517,117	42.9	5,106,401	115.8
Suburban	1,546,671	16.9	7,000,947	31.6	5,454,276	352.6
Small Metro	1,980,839	21.6	3,935,563	17.7	1,954,724	98.7
Central City	1,767,014	19.3	3,482,734	15.7	1,715,720	97.1
Suburban	213,825	2.3	452,829	2.0	239,004	111.8
Non-Metro Adjacent	860,647	9.4	1,311,131	5.9	450,484	52.3
Non-Metro Non-Adjacent	359,834	3.9	418,373	1.9	58,539	16.3
Total Commuters	***9,158,707***	***100.0***	***22,183,131***	***100.0***	***13,024,424***	***142.2***

	Scenario 00-04					
	2000		2040		2000-2040 Change	
Residence County Type	No.	%	No.	%	Num.	%
Large Metro	5,957,387	65.0	14,383,972	76.7	8,426,585	141.4
Central City	4,410,716	48.2	7,350,865	39.2	2,940,149	66.7
Suburban	1,546,671	16.9	7,033,107	37.5	5,486,436	354.7
Small Metro	1,980,839	21.6	2,963,137	15.8	982,298	49.6
Central City	1,767,014	19.3	2,733,361	14.6	966,347	54.7
Suburban	213,825	2.3	229,776	1.2	15,951	7.5
Non-Metro Adjacent	860,647	9.4	1,024,640	5.5	163,993	19.1
Non-Metro Non-Adjacent	359,834	3.9	370,388	2.0	10,554	2.9
Total Commuters	***9,158,707***	***100.0***	***18,742,137***	***100.0***	***9,583,430***	***104.6***

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates and Projections Program. See text for definitions.

Note: Commuters from out of state are not included.

Table 4-8:
Commuters by Work Location by Year, and Numeric and Percent Change, 2000-2040 for Alternative Population Projection Scenarios

Work Location County Type	Scenario 1.0					
	2000		2040		2000-2040 Change	
	No.	%	No.	%	Num.	%
Large Metro	6,052,142	66.1	16,511,452	75.1	10,459,310	172.8
Central City	4,994,538	54.5	12,424,602	56.5	7,430,064	148.8
Suburban	1,057,604	11.5	4,086,850	18.6	3,029,246	286.4
Small Metro	2,021,646	22.1	3,915,896	17.8	1,894,250	93.7
Central City	1,884,720	20.6	3,658,849	16.6	1,774,129	94.1
Suburban	136,926	1.5	257,047	1.2	120,121	87.7
Non-Metro Adjacent	724,251	7.9	1,115,055	5.1	390,804	54.0
Non-Metro Non-Adjacent	359,446	3.9	436,743	2.0	77,297	21.5
Total Commuters	***9,157,485***	***100.0***	***21,979,146***	***100.0***	***12,821,661***	***140.0***

Work Location County Type	Scenario 00-04					
	2000		2040		2000-2040 Change	
	No.	%	No.	%	Num.	%
Large Metro	6,052,142	66.1	14,335,678	77.2	8,283,536	136.9
Central City	4,994,538	54.5	10,420,046	56.1	5,425,508	108.6
Suburban	1,057,604	11.5	3,915,632	21.1	2,858,028	270.2
Small Metro	2,021,646	22.1	2,962,333	16.0	940,687	46.5
Central City	1,884,720	20.6	2,812,225	15.1	927,505	49.2
Suburban	136,926	1.5	150,108	0.8	13,182	9.6
Non-Metro Adjacent	724,251	7.9	891,596	4.8	167,345	23.1
Non-Metro Non-Adjacent	359,446	3.9	380,999	2.1	21,553	6.0
Total Commuters	***9,157,485***	***100.0***	***18,570,606***	***100.0***	***9,413,121***	***102.8***

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates and Projections Program. See text for definitions.

Note: Commuters from out of state are not included.

Should these assumptions hold throughout the projection period, most workers will continue to work within the same county in which they live. However should trends continue, a larger percentage of people will commute outside their home county in 2040 than in 2000. In 2000, 78.6 percent of all workers commuted within the same county where they lived. By 2040, this percentage will decrease to 73.2 percent under projection scenario 1.0 and 70.6 percent in scenario 00-04 (Tables 4-9 and 4-10). Although the percentage of all commuters leaving suburban counties for central city counties increases, the numeric and percentage growth in these origin and destinations will also be substantial.

Table 4-9:
Origin and Destination of Commuters by County Type in 2040 by Percent of Commuters from Origin to Destination County Type (Scenario 1.0)

Residence County (Origin)	Percent of Commuters to Work County (Destination)																	
			Same MSA				Other MSA				Non-Metro				Out of State			
	Same County		Central City County		Suburban County		Central City County		Suburban County		Adjacent		Non-Adjacent				Number (1,000s)	
	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040
Large Metro	77.6	70.5	15.8	22.7	4.5	4.4	0.7	0.8	0.2	0.2	0.5	0.6	0.1	0.1	0.7	0.7	5,957.4	16,518.1
Central City	88.5	88.5	5.3	5.2	4.6	4.8	0.5	0.5	0.1	0.1	0.3	0.3	0.1	0.1	0.6	0.6	4,410.7	9,517.1
Suburban	46.5	46.1	45.6	46.5	4.1	4.0	1.2	1.1	0.5	0.5	1.1	0.9	0.2	0.2	0.8	0.8	1,546.7	7,000.9
Small Metro	86.4	86.1	3.8	4.5	0.8	0.7	3.8	3.9	1.1	1.0	2.1	1.8	0.2	0.2	1.8	1.8	1,980.8	3,935.6
Central City	91.3	91.7	0.5	0.3	0.8	0.7	2.3	2.6	1.1	1.0	1.9	1.6	0.2	0.2	1.8	1.8	1,767.0	3,482.7
Suburban	45.5	42.8	30.9	36.6	0.7	0.4	16.4	13.9	0.5	0.6	3.3	3.3	0.4	0.3	2.2	2.0	213.8	452.8
Non-Metro Adjacent	66.6	65.1					17.1	18.9	6.0	6.4	6.4	5.9	2.8	2.6	1.2	1.0	860.6	1,311.1
Non-Metro Non-Adjacent	82.6	82.9					3.4	3.3	0.8	0.7	5.7	5.6	5.9	5.8	1.6	1.6	359.8	418.4
Percent All by Workplace	***78.6***	***73.2***	***11.1***	***17.7***	***3.1***	***3.4***	***3.0***	***2.4***	***1.0***	***0.7***	***1.6***	***1.2***	***0.6***	***0.4***	***1.0***	***0.9***	***9,158.7***	**22,183.1**

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates and Projections Program. See text for definitions.

Table 4-10:
Origin and Destination of Commuters by County Type in 2040 by Percent of Commuters from Origin to Destination County Type (Scenario 00-04)

Residence County (Origin)	Percent of Commuters to Work County (Destination)																	
			Same MSA				Other MSA				Non-Metro				Out of State			
	Same County		Central City County		Suburban County		Central City County		Suburban County		Adjacent		Non-Adjacent				Number (1,000s)	
	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040	2000	2040
Large Metro	77.6	67.1	15.8	26.3	4.5	4.2	0.7	0.7	0.2	0.2	0.5	0.6	0.1	0.1	0.7	0.7	5,957.4	14,384.0
Central City	88.5	87.6	5.3	6.4	4.6	4.4	0.5	0.5	0.1	0.1	0.3	0.3	0.1	0.1	0.6	0.6	4,410.7	7,350.9
Suburban	46.5	45.7	45.6	47.1	4.1	4.0	1.2	1.0	0.5	0.4	1.1	0.9	0.2	0.2	0.8	0.8	1,546.7	7,033.1
Small Metro	86.4	87.8	3.8	2.8	0.8	0.7	3.8	3.8	1.1	1.0	2.1	1.8	0.2	0.2	1.8	1.8	1,980.8	2,963.1
Central City	91.3	91.5	0.5	0.4	0.8	0.7	2.3	2.7	1.1	1.1	1.9	1.7	0.2	0.2	1.8	1.8	1,767.0	2,733.4
Suburban	45.5	44.6	30.9	31.4	0.7	0.7	16.4	16.8	0.5	0.5	3.3	3.5	0.4	0.4	2.2	2.2	213.8	229.8
Non-Metro Adjacent	66.6	65.8					17.1	18.3	6.0	6.3	6.4	5.9	2.8	2.6	1.2	1.0	860.6	1,024.6
Non-Metro Non-Adjacent	82.6	82.7					3.4	3.4	0.8	0.8	5.7	5.7	5.9	5.8	1.6	1.6	359.8	370.4
Percent All by Workplace	***78.6***	***70.6***	***11.1***	***20.7***	***3.1***	***3.3***	***3.0***	***2.2***	***1.0***	***0.7***	***1.6***	***1.2***	***0.6***	***0.9***	***1.0***	***0.9***	***9,158.7***	***18,742.1***

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates and Projections Program. See text for definitions.

With continued suburban population growth, a larger number of commuters to other counties will increase significantly, with the largest increase occurring in the number of workers commuting from suburban to central city counties. Under these assumptions about commuting rates and under both population projection scenarios, the number of commuters commuting from large metropolitan suburban to central city counties of the same MSA will increase by over 360 percent, or over 2.5 million commuters (Table 4-11). During this same period, the number of workers commuting from large metropolitan suburban counties and other suburban counties in the same MSA will increase by over 340 percent, or more than 210,000 workers between 2000 and 2040. These projections show substantially different results in intra-metropolitan county commuting for small metropolitan areas due to significant differences in trends in the 1990s and post 2000. A large part of this difference is related to differences in population due to military deployments for certain counties such as those in the Killeen-Temple MSA.

Table 4-11:
Change in Intra-Metropolitan Commuter Flows, 2000-2040

	Scenario 1.0			
	Large MSA		Small MSA	
Destination County	Num.	%	Num.	%
Central City County to Central City County	258,494	111.1	2,321	24.0
Central City County to Suburban County	251,426	123.3	11,182	76.6
Suburban County to Central City County	2,549,077	361.2	99,700	150.9
Suburban County to Suburban County	213,965	340.6	531	35.9

	Scenario 00-04			
	Large MSA		Small MSA	
Destination County	Num.	%	Num.	%
Central City County to Central City County	239,181	102.8	2,039	21.1
Central City County to Suburban County	117,290	57.5	3,610	24.7
Suburban County to Central City County	2,609,272	369.7	6,008	9.1
Suburban County to Suburban County	215,107	342.4	49	3.3

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates & Projections Program. See text for definitions.

Change in the number of commuters from non-metropolitan counties to other counties will show larger increases if 1990s trends in net migration continue. Commuters are more likely to leave non-metropolitan counties adjacent to metropolitan areas than those who live in non-metropolitan counties not adjacent to metropolitan areas. Under population projection scenario 1.0, the number of commuters commuting from non-metropolitan adjacent counties will increase by 68.3 percent or over 100,000 workers (Table 4-12). All other commuting flows from non-metropolitan counties will increase by over 40 percent under this same scenario. Assuming the patterns in the 00-04 scenario the effects are more dramatic for non-metropolitan counties and thus these same impacts can be seen in the fact that the population projection scenario that assumes post 2000 rates of net migration results in smaller changes in the number of commuters from non-metropolitan counties to other counties.

Table 4-12:
Change in Non-Metropolitan Commuting Destinations by Metropolitan Adjacency Status, 2000-2040

	Scenario 1.0			
	Adjacent		Non-Adjacent	
Destination County	Num.	%	Num.	%
To Central City County	100,640	68.3	1,391	11.3
To Suburban County	32,044	61.8	221	7.7
To Non-Metro Adjacent County	22,067	40.2	2,985	14.6
To Non-Metro Non-Adjacent County	3,061	45.1	3,061	14.5

	Scenario 00-04			
	Adjacent		Non-Adjacent	
Destination County	Num.	%	Num.	%
To Central City County	39,643	26.9	267	2.2
To Suburban County	12,519	24.2	-28	-1.0
To Non-Metro Adjacent County	6,133	11.2	775	3.8
To Non-Metro Non-Adjacent County	3,354	14.1	269	1.3

Source: Derived from Census2000 CTPP-3 & Texas State Data Center Estimates & Projections Program. See text for definitions.

Conclusion

Should projected trends continue, the number of workers working in Texas will increase significantly and most of these individuals will be living and working within metropolitan areas. Although it would be difficult to anticipate all of the changes in land use that may occur during this period, we examined potential impacts to county-to-county commuting patterns under alternative scenarios of population and labor force change in order to understand the impacts of current trends on future transportation demand. The results of these analyses suggest that should these trends continue, several important changes can be anticipated. These include:

1. ***A Decline in the percentage of people working and living within the same county.*** Almost 90 percent of all workers lived and worked within the same county in 1990. This had dropped by about 10 percent by 2000. Under the assumptions presented here, the percentage of people living and working in the same county will be a little more than 70 percent in 2040.

2. ***Continued growth in metropolitan jobs and workers.*** The fastest growth in workers and jobs will occur in metropolitan and in particular, large metropolitan areas. By 2040, approximately 93 percent of all jobs and all workers will be located within metropolitan counties.

3. ***Growth in suburban workers and jobs relative to central city counties.*** The fastest growth in development has occurred in suburban counties of large metropolitan areas. If these trends continue, almost 300 percent more jobs and workers will be located in these counties in 2040 than in 2000.

4. ***Growth in suburban to central city commuters.*** Between 2000 and 2040, there will be faster growth in the number of workers living in suburban counties than in the central city counties, thus significant growth in commuting between these counties and central cities will occur.

5. ***Growth in suburban to suburban commutes.*** Although it is not likely to surpass the growth in commuting between suburban and central city counties, under these projection scenarios continued growth will increase the number of commuters leaving suburban counties to work in nearby suburban counties.

In sum, then, the demographic changes projected for Texas in the coming decades will significantly increase the level of commuting in the State and accentuate specific patterns of commuting. Although it must be recognized that unanticipated changes in population growth and in commuting patterns will alter these projections, the data suggest that anticipation of population growth and distribution patterns are of substantial importance in planning for transportation infrastructure.

Chapter 5

Future Change in Texas Households and Implications for Transportation Expenditures

Changes in Texas' population will affect the resources that households have available for transportation services should current socioeconomic differentials among racial/ethnic, age and household groups continue. Changes in resources will affect household capacities to spend on transportation related services and products. The Texas Department of Transportation (TxDOT) derives most of its revenue from consumption related taxes, including fuel taxes and fees for motor vehicle licensing and registration. Thus, changes in household expenditures will affect the revenue available from these sources. Differences in how households spend money on transportation related products and services also serve as a proxy for understanding transportation related demand. Households with higher incomes tend to travel more, own more vehicles and spend more on transportation related products and services. Improvements in the overall income of Texas households will increase travel and total transportation expenditures. At the same time, spending on public transportation could increase at a relatively faster pace than all other transportation items should lower income households increase at rates faster than higher income households.

In this chapter we present alternative projections of transportation expenditures by general categories in comparison with total household expenditures. In order to estimate household expenditures for the base year of 2000, data were obtained from the Consumer Expenditure Survey sponsored by the U.S. Bureau of Labor Statistics (2002). Average expenditures differentiated by age, sex, and race/ethnicity and household type and household tenure were multiplied by the projections of households by age, sex, race/ethnicity, householder tenure, and household type. Texas-specific data on expenditures by specific age and race/ethnicity characteristics were not available; however, the national level data were sufficient for these analyses of transportation expenditures. Because our goal is to understand the effects of demographic changes on transportation spending, the data presented here do not incorporate the effects of inflation nor are they reflective of changes in such things as fuel prices. All data presented here are in 2000 constant dollars to ease comparisons. The transportation categories include purchases of: 1) new cars (yearly outlays); 2) used cars and other vehicles (yearly outlays); 3) gasoline and other motor fuels; 4) other vehicle expenses (including maintenance and repair and insurance); and 5) fees for public transportation.

Projections of Transportation Expenditures

Continued increases in the population and in households will increase total consumer expenditure significantly, from an estimated $274.0 billion in 2000 to between $570.6 billion and $668.2 billion (depending upon the projection scenario). As shown in Tables 5-1 and 5-2, this is an increase of 108.2 to 143.8 percent. In comparison, the rates of growth in the number of households range from 128.3 percent using the population projection that assumes 2000-2004 rates of net migration (Scenario 00-04) and 167.4 percent using the population projection that assumes 1990-2000 rates of net migration (Scenario 1.0). Thus, consumer spending will increase at a pace slower than total household growth. This reflects declining socioeconomic resources available to Texas households as the characteristics of households change.

Differences in expenditure characteristics of current households are evident in the aggregate change in specific transportation spending categories. According to these assumptions, consumer expenditures on all transportation items will increase to between $119.5 billion and $140.2 billion in 2040 (Table 5-1). Overall, transportation spending will increase faster than overall consumer spending with all household expenditures increasing between 108.2 and 143.8 percent compared to between 114.0 and 151.1 percent for all transportation expenditures (Table 5-2). All categories of

transportation expenditures will see increases of more than 100 percent under both population projection scenarios. However, the fastest percentage growth will occur in expenditures for public transportation (from 125.2 to 163.1 percent), followed by increases in expenditures on new cars (118.6 percent and 156.2 percent).

Table 5-1:
Total Household Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category for Texas Households Using Alternative Population Projection Scenarios, 2000-2040 (Millions of 2000 Dollars)

Year	Total HH Expenditures	Total Transportation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Transportation
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)							
2000	$ 274,034.8	$ 55,817.9	$ 11,693.6	$ 14,128.8	$ 9,855.4	$ 16,970.6	$3,169.5
2010	342,256.1	70,350.7	14,692.3	17,928.4	12,446.8	21,235.0	4,048.2
2020	428,818.0	88,812.5	18,786.8	22,548.9	15,738.3	26,546.2	5,192.4
2030	534,789.3	111,399.2	23,777.9	28,260.1	19,771.7	32,986.8	6,602.7
2040	668,222.7	140,174.8	29,959.4	35,670.1	24,961.6	41,243.8	8,340.0
Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)							
2000	$ 274,034.8	$ 55,817.9	$ 11,693.6	$ 14,128.8	$ 9,855.4	$ 16,970.6	$3,169.5
2010	330,840.3	67,993.9	14,197.1	17,326.9	12,034.4	20,524.5	3,911.0
2020	399,327.2	82,643.3	17,479.5	20,959.2	14,659.1	24,707.8	4,837.7
2030	477,910.3	99,442.3	21,246.0	25,165.0	17,662.0	29,455.6	5,913.7
2040	570,628.0	119,458.5	25,562.5	30,271.3	21,287.6	35,199.2	7,138.0

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Table 5-2:
Percent Change in Total Household Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category for Texas Households Using Alternative Population Projection Scenarios, 2000-2040

Period	Total HH Expenditures	Total Transportation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Transportation
			Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)				
2000-10	24.9	26.0	25.6	26.9	26.3	25.1	27.7
2010-20	25.3	26.2	27.9	25.8	26.4	25.0	28.3
2020-30	24.7	25.4	26.6	25.3	25.6	24.3	27.2
2030-40	25.0	25.8	26.0	26.2	26.2	25.0	26.3
2000-40	143.8	151.1	156.2	152.5	153.3	143.0	163.1
			Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)				
2000-10	20.7	21.8	21.4	22.6	22.1	20.9	23.4
2010-20	20.7	21.5	23.1	21.0	21.8	20.4	23.7
2020-30	19.7	20.3	21.5	20.1	20.5	19.2	22.2
2030-40	19.4	20.1	20.3	20.3	20.5	19.5	20.7
2000-40	108.2	114.0	118.6	114.3	116.0	107.4	125.2

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

In order to further illustrate the effects of differentials in socioeconomic resources due to population and household characteristics, Table 5-3 illustrates how expenditures would change if, in 2040, the total number of households was as projected for 2040 but the demographic and household characteristics were the same as that of 2000. We thus assume similar proportions of households by race/ethnicity, age and sex in 2040 as was present in 2000. As shown in the table, if the characteristics of Texas households in 2040 were the same as 2000, expenditures on transportation items would be larger than those actually projected. The net effect of changes in household and population characteristics will be to decrease overall spending on transportation items by about $12.0 billion. Changes in socioeconomic resources are also reflected in the differences in the net change for specific transportation spending items. Of all of the consumer expenditures, spending on public transportation would be least impacted. Declining resources of Texas households, despite overall household growth will significantly impact transportation spending.

Table 5-3:
Total Transportation Expenditures and Transportation Expenditures by Transportation Expenditure Category for 2040 Using the Alternative Population Projection Scenarios and Scenarios that Assume Similar Household Composition by Sex, Age, and Race/Ethnicity in 2040 as 2000

	Total Projected Expenses		Difference	
	2040 Projected Composition	Same as 2000 Composition	$Millions	Percent
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)				
New Cars	$ 29,959.4	$ 31,942.1	$ -1,982.7	-6.6
Used Cars & Other Vehicles	35,670.1	38,518.1	-2,848.1	-8.0
Gas & Other Fuels	24,961.6	26,842.1	-1,880.5	-7.5
Other Vehicle Expenses	41,243.8	46,279.4	-5,035.6	-12.2
Public Transportation	8,340.0	8,549.7	-209.8	-2.5
Total Transportation	140,174.8	152,131.4	-11,956.6	-8.5
Assuming Net Migration Equal to 2000-2040 (Scenario 00-04)				
New Cars	$ 25,562.5	$ 27,591.8	$ -2,029.3	-7.9
Used Cars & Other Vehicles	30,271.3	33,071.6	-2,800.3	-9.3
Gas & Other Fuels	21,287.6	23,110.3	-1,822.7	-8.6
Other Vehicle Expenses	35,199.2	39,908.9	-4,709.7	-13.4
Public Transportation	7,138.0	7,350.8	-212.8	-3.0
Total Transportation	119,458.5	131,033.4	-11,574.8	-9.7

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

These changes are reflective of declining aggregate household income due to changes in the characteristics of Texas households and current differentials in socioeconomic status among demographic and household groups. In Table 5-4, expenditures per household for the projections shown in Table 5-1 are presented in order to highlight the changes in overall consumer expenditure patterns reflected in the population projection scenarios. On a per household basis, total consumer expenditures decrease over every period from 2000 to 2040. In addition, total transportation expenditures and all categories of transportation expenditures decrease as well over these same periods. Of the expenditure items, public transportation shows the smallest decline. On a per household basis, public transportation expenditures increase only slightly in 2010 to $431 per household before declining to around $422 in 2040 (from $429 in 2000). Under these assumptions, total transportation expenditures for 2040 will be between $7,079 and $7,090, down from $7,550 in 2000 (an almost $500 decrease in per household transportation expenditures from 2000).

Table 5-4:
Total Household Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category per Household Using Alternative Population Projection Scenarios, 2000-2040

Year	Total HH Expenditures	Total Trans-portation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Trans-portation
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)							
2000	$ 37,065	$ 7,550	$ 1,582	$ 1,911	$ 1,333	$ 2,295	$ 429
2010	36,407	7,484	1,563	1,907	1,324	2,259	431
2020	35,468	7,346	1,554	1,865	1,302	2,196	429
2030	34,492	7,185	1,534	1,823	1,275	2,128	426
2040	33,798	7,090	1,515	1,804	1,263	2,086	422
Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)							
2000	$ 37,065	$ 7,550	$ 1,582	$ 1,911	$ 1,333	$ 2,295	$ 429
2010	36,432	7,487	1,563	1,908	1,325	2,260	431
2020	35,515	7,350	1,555	1,864	1,304	2,197	430
2030	34,537	7,186	1,535	1,819	1,276	2,129	427
2040	33,814	7,079	1,515	1,794	1,261	2,086	423

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

As noted in previous chapters, Texas households will become increasingly non-Anglo, and specifically Hispanic in racial/ethnic composition. A greater proportion of total household and transportation expenditures will come from Hispanic households as shown in Table 5-5. In 2000, 22.0 percent of all household expenditures and 24.2 percent of all transportation expenditures were made by Hispanic households. By 2040, over 50 percent of all household expenditures and transportation expenditures will be from Hispanic households. At the same time, Anglo households will see their share of total and transportation expenditures decline from over 60 percent to approximately 30 percent under both scenarios. Thus, demand for transportation related products and services will be increasingly dependent upon non-Anglo headed households.

Table 5-5:
Percent of Total Household and Transportation Expenditures in Texas by Expenditure Category and Race/Ethnicity Using Alternative Population Projection Scenarios, 2000-2040

Race/ Ethnicity	Total HH Expenditures	Total Trans-portation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Trans-portation
				2000			
Anglo	66.4	64.6	66.6	61.6	63.8	65.7	67.2
Black	8.6	8.0	6.8	8.0	8.5	8.8	7.0
Hispanic	22.0	24.2	22.1	27.8	24.8	22.6	22.0
Other	3.0	3.3	4.4	2.7	2.9	3.0	3.8
				2040 Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)			
Anglo	31.6	29.1	30.3	26.5	28.2	30.7	31.8
Black	7.1	6.4	5.5	6.2	6.7	7.2	5.5
Hispanic	51.8	54.5	49.8	59.7	56.3	53.1	50.4
Other	9.4	10.0	14.5	7.6	8.7	9.0	12.3
				2040 Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)			
Anglo	32.4	30.0	31.1	27.4	29.0	31.5	32.5
Black	7.2	6.4	5.5	6.2	6.7	7.2	5.5
Hispanic	51.1	53.7	49.0	58.8	55.6	52.4	49.9
Other	9.3	9.9	14.4	7.6	8.7	9.0	12.2

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Total expenditures by race/ethnicity of the householder increase more for non-Anglo households due primarily to differentials in household growth (Tables 5-6 and 5-7). Under population projection scenario 1.0, while total transportation expenditure growth will be 151.1 percent, the growth in transportation expenditures will be 13.3 percent for Anglo households, 100.7 percent for Black households, 466.6 percent for Hispanic households, and 668.5 percent for Other households. In terms of specific transportation expenditures, the largest increases for households of all racial/ethnic groups except Blacks are those related to public transportation. Should changes in the future population follow patterns similar to those experienced in the post-2000 period, consumer expenditure patterns will change from those presented in Table 5-6. Due to lower rates of growth in the number of Anglo households using the population projection scenario 00-04, transportation expenditures by Anglo households in 2040 will be slightly less than those estimated for 2000, with increases seen in only expenditures for new cars and on public transportation (Table 5-7). All other households will see increases in expenditures, although not as fast as those under population projection scenario 1.0.

Table 5-6:
Total Consumer Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category (in Millions of 2000 Dollars) and Race/Ethnicity in 2000 and Projections for 2040 Using the Population Projection Scenario that Assumes 1990-2000 Rates of Net Migration (Scenario 1.0) 2000-2040

Race/ Ethnicity	Total HH Expenditures	Total Trans-portation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Trans-portation
				2000			
Anglo	$ 182,002.2	$36,050.9	$ 7,793.1	$ 8,697.4	$ 6,285.7	$ 11,144.6	$ 2,130.1
Black	23,538.0	4,467.1	796.4	1,125.5	837.0	1,486.5	221.6
Hispanic	60,177.6	13,481.9	2,583.7	3,925.6	2,448.6	3,827.9	696.2
Other	8,317.0	1,818.0	520.3	380.4	284.1	511.6	121.6
Total	274,034.8	55,817.9	11,693.6	14,128.8	9,855.4	16,970.6	3,169.5
				2040			
Anglo	$ 211,237.4	$40,850.9	$ 9,067.3	$ 9,444.8	$ 7,041.6	$ 12,645.0	$ 2,652.2
Black	47,749.2	8,966.1	1,651.4	2,211.3	1,680.4	2,967.7	455.2
Hispanic	346,404.9	76,386.5	14,906.9	21,310.7	14,064.5	21,901.6	4,202.9
Other	62,831.2	13,971.3	4,333.8	2,703.3	2,175.2	3,729.4	1,029.6
Total	668,222.7	140,174.8	29,959.4	35,670.1	24,961.6	41,243.8	8,340.0
				Numerical Change, 2000-2040			
Anglo	$ 29,235.2	$ 4,800.0	$ 1,274.2	$ 747.4	$ 755.9	$ 1,500.4	$ 522.1
Black	24,211.1	4,499.0	855.0	1,085.8	843.4	1,481.2	233.6
Hispanic	286,227.3	62,904.6	12,323.1	17,385.1	11,615.9	18,073.7	3,506.7
Other	54,514.3	12,153.3	3,813.4	2,322.8	1,891.1	3,217.8	908.0
Total	394,187.9	84,356.9	18,265.8	21,541.2	15,106.2	24,273.2	5,170.5
				Percentage Change, 2000-2040			
Anglo	16.1	13.3	16.4	8.6	12.0	13.5	24.5
Black	102.9	100.7	107.4	96.5	100.8	99.6	105.4
Hispanic	475.6	466.6	477.0	442.9	474.4	472.2	503.7
Other	655.5	668.5	732.9	610.6	665.7	629.0	747.0
Total	143.8	151.1	156.2	152.5	153.3	143.0	163.1

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Table 5-7:
Total Consumer Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category (in Millions of 2000 Dollars) and Race/Ethnicity in 2000 and Projections for 2040 Using the Population Projection Scenario that Assumes 2000-2004 Rates of Net Migration (Scenario 00-04) 2000-2040

Race/ Ethnicity	Total HH Expenditures	Total Trans-portation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Trans-portation
				2000			
Anglo	$ 182,002.2	$36,050.9	$ 7,793.1	$ 8,697.4	$ 6,285.7	$ 11,144.6	$ 2,130.1
Black	23,538.0	4,467.1	796.4	1,125.5	837.0	1,486.5	221.6
Hispanic	60,177.6	13,481.9	2,583.7	3,925.6	2,448.6	3,827.9	696.2
Other	8,317.0	1,818.0	520.3	380.4	284.1	511.6	121.6
Total	274,034.8	55,817.9	11,693.6	14,128.8	9,855.4	16,970.6	3,169.5
				2040			
Anglo	$ 184,865.1	$35,778.8	$ 7,942.2	$ 8,281.0	$ 6,167.7	$ 11,070.5	$ 2,317.5
Black	40,846.4	7,663.0	1,410.0	1,889.3	1,436.9	2,537.2	389.7
Hispanic	291,676.2	64,161.3	12,535.9	17,797.7	11,839.5	18,429.3	3,558.9
Other	53,240.3	11,855.4	3,674.4	2,303.3	1,843.5	3,162.2	871.9
Total	570,628.0	119,458.5	25,562.5	30,271.3	21,287.6	35,199.2	7,138.0
				Numerical Change, 2000-2040			
Anglo	$ 2,862.9	$ -272.1	$ 149.0	$ -416.3	$ -118.0	$ -74.1	$ 187.3
Black	17,308.4	3,196.0	613.6	763.8	599.8	1,050.7	168.0
Hispanic	231,498.6	50,679.3	9,952.2	13,872.2	9,390.8	14,601.4	2,862.8
Other	44,923.4	10,037.4	3,154.1	1,922.8	1,559.4	2,650.6	750.4
Total	296,593.2	63,640.6	13,868.9	16,142.5	11,432.2	18,228.6	3,968.5
				Percentage Change, 2000-2040			
Anglo	1.6	-0.8	1.9	-4.8	-1.9	-0.7	8.8
Black	73.5	71.5	77.0	67.9	71.7	70.7	75.8
Hispanic	384.7	375.9	385.2	353.4	383.5	381.4	411.2
Other	540.1	552.1	606.2	505.4	548.9	518.1	617.3
Total	108.2	114.0	118.6	114.3	116.0	107.4	125.2

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Due to increases in non-Anglo households, the largest growth in total household and transportation expenditures will be from non-Anglo households. Using the population projection scenario that assumes 1990-2000 rates of net migration (Scenario 1.0), only 5.7 percent of the net change in transportation expenditures from 2000 to 2040 will be from Anglo households (Table 5-8). And under the alternative population projection scenario (Scenario 00-04), total transportation expenditures by Anglo households will decline from 2000 to 2040, thus having no impact on growth in total transportation expenditures. Hispanic households will contribute the most to future growth in

expenditures by specific transportation expenditure category. At the same time, because of differences in expenditure by household characteristics, the proportion of net change by race/ethnicity will be different for each transportation spending category.

Table 5-8:
Percent of Net Change in Total Household Expenditure in Texas by Expenditure Category and Race/Ethnicity Using Alternative Population Projection Scenarios, 2000-2040

Race/ Ethnicity	Total HH Expenditures	Total Trans-portation	New Cars	Used Cars & Other Vehicles	Gas & Other Fuels	Other Vehicle Expenses	Public Trans-portation
			Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)				
Anglo	7.4	5.7	7.0	3.5	5.0	6.2	10.1
Black	6.1	5.3	4.7	5.0	5.6	6.1	4.5
Hispanic	72.6	74.6	67.5	80.7	76.9	74.5	67.8
Other	13.8	14.4	20.9	10.8	12.5	13.3	17.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Assuming Net Migration Equal to 2000-2004 (Scenario 00-04)				
Anglo	1.0	-0.4	1.1	-2.6	-1.0	-0.4	4.7
Black	5.8	5.0	4.4	4.7	5.2	5.8	4.2
Hispanic	78.1	79.6	71.8	85.9	82.1	80.1	72.1
Other	15.1	15.8	22.7	11.9	13.6	14.5	18.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Projections of Transportation Expenditures by Household Type

Changes in consumer spending will also be affected by changes in the characteristics of Texas households. On average, married-couple families spend more on transportation items than all other types of households. As discussed in Chapter 2, single-parent family households and non-family households are increasing faster than married-couple families. In order to understand the effects of these changes, average expenditures by household type were applied to projections of households by household type for the two population projection scenarios. The data available did not include specific rates by age, race/ethnicity, and sex. Therefore, the projections of expenditures will be slightly different than those presented previously. Despite increases in the proportions of all other types of households, married-couple family households will remain the dominant household type in the future. In the aggregate, married-couple families will continue to spend more than any other household type (Table 5-9). At the same time, due to rapid increases in single parent households (male and female householder households), single adult households will see the largest percentage increase from 2000 to 2040 using both projection scenarios (Table 5-10).

Table 5-9:
Total Household Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category for Texas Households by Household Type Using Alternative Population Projection Scenarios, 2000-2040 (Millions of 2000 Dollars)

		Family			
	All House-holds	Married Couple	Male House-holder	Female House - holder	Non-Family
2000					
New Cars	$12,304.6	$ 8,755.9	$ 298.4	$ 532.9	$ 2,717.5
Used Cars & Other Vehicles	15,199.7	9,948.7	269.7	1,005.2	3,976.1
Gas & Other Fuels	10,350.2	6,923.0	271.4	627.4	2,528.5
Other Vehicle Expenses	17,574.3	11,789.9	439.3	1,106.5	4,238.5
Public Transportation	3,211.3	2,082.7	96.6	278.2	753.9
Total Transportation	58,640.1	39,500.2	1,375.4	3,550.1	14,214.5
2040 Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)					
New Cars	$31,959.0	$ 23,855.0	$ 646.7	$ 965.4	$ 6,492.0
Used Cars & Other Vehicles	37,904.0	23,977.3	842.6	2,843.5	10,240.7
Gas & Other Fuels	25,646.0	17,969.4	835.0	1,597.2	5,244.5
Other Vehicle Expenses	41,856.8	29,448.4	1,280.6	2,780.8	8,347.0
Public Transportation	8,174.7	5,426.8	302.8	721.7	1,723.4
Total Transportation	145,540.5	100,676.8	3,907.7	8,908.6	32,047.5
2040 Assuming Net Migration Equal to 2000-2040 (Scenario 00-04)					
New Cars	$27,366.3	$ 20,527.5	$ 552.2	$ 819.9	$ 5,466.7
Used Cars & Other Vehicles	32,329.1	20,623.5	712.2	2,364.3	8,629.1
Gas & Other Fuels	21,936.8	15,450.7	703.9	1,336.8	4,445.3
Other Vehicle Expenses	35,828.0	25,351.0	1,073.9	2,330.1	7,072.9
Public Transportation	6,986.9	4,666.4	254.5	606.6	1,459.4
Total Transportation	124,447.0	86,619.2	3,296.6	7,457.7	27,073.5

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Table 5-10:
Percent Change in Total Household Expenditures, Total Transportation Expenditures, and Transportation Expenditures by Transportation Expenditure Category for Texas Households by Household Type Using Alternative Population Projection Scenarios, 2000-2040

		Family			
	All House-holds	Married Couple	Male House-holder	Female House - holder	Non-Family
Assuming Net Migration Equal to 1990-2000 (Scenario 1.0)					
New Cars	159.7	172.4	116.7	81.2	138.9
Used Cars & Other Vehicles	149.4	141.0	212.4	182.9	157.6
Gas & Other Fuels	147.8	159.6	207.7	154.6	107.4
Other Vehicle Expenses	138.2	149.8	191.5	151.3	96.9
Public Transportation	154.6	160.6	213.6	159.4	128.6
Total Transportation	148.2	154.9	184.1	150.9	125.5
Assuming Net Migration Equal to 2000-2040 (Scenario 00-04)					
New Cars	122.4	134.4	85.0	53.8	101.2
Used Cars & Other Vehicles	112.7	107.3	164.1	135.2	117.0
Gas & Other Fuels	111.9	123.2	159.4	113.1	75.8
Other Vehicle Expenses	103.9	115.0	144.4	110.6	66.9
Public Transportation	117.6	124.1	163.6	118.0	93.6
Total Transportation	112.2	119.3	139.7	110.1	90.5

Source: Derived by the authors from Texas State Data Center Population Estimates and Projections Program and Bureau of Labor Statistics 2002.

Conclusion

Household expenditures on transportation items will increase faster than total household expenditures from 2000 to 2040. Under a projection scenario that uses 1990s rates of net migration, total household expenditures will increase by 144 percent, while transportation expenditures will increase by 151 percent. However, given current income disparities between Anglo and non-Anglo households, these expenditures will not be as substantial as they would have been if the resource levels in non-Anglo households were the same as in Anglo households (a difference of $12.0 billion). Between 2000 and 2040, per household expenditures on transportation items will decline by about $500 per household. Since TxDOT depends upon consumptive related taxes and fees, these changes could impact TxDOT's resources. We highlight the potential impacts to transportation planning below:

1. ***Changes in public transportation spending relative to other items.*** Although it remains a small proportion of the total expenditures on transportation items, changes in per household spending on public transportation will decline less than that of any other transportation item (and increase slightly in the near term).

2. ***Implications of changes in household budget for travel.*** In as much as spending serves as a proxy for household travel, future Texas households will travel less per household than today given current expenditure patterns. Improvement in the socioeconomic resources of Texas households should increase the amount spent on travel and related travel demand.

3. Increase in the percentage of transportation expenditures from non-Anglo households. As highlighted in this chapter, the fastest increases in expenditures will be from non-Anglo households. By 2040, over 65 percent of all spending on transportation items will be from non-Anglo households (and over 50 percent will be from Hispanic households). Texas population and households are becoming more diverse. Changes in the racial/ethnic composition of Texas will mean that businesses and agencies will find an increasingly diverse customer base.

Chapter 6

Population Change and Implications for Public Transportation Demand

In Texas as in the rest of the nation, the automobile has become an important determinant of individual mobility. The overwhelming majority of Texans age 16 and older are licensed drivers and most households own at least one vehicle. But not all persons have access to personal vehicles and many are not licensed to drive. According to our projections of the number of drivers presented in Chapter 3, there will be over 5.7 million adults who are not licensed to drive in Texas by 2040. In order to meet their daily travel needs, these individuals will seek out other forms of transportation – including carpooling with friends or family, walking or riding a bicycle or utilizing public transportation. In this chapter we explore the effects of changing demographics on the demand for public transportation.

People choose to utilize public transportation for a variety of reasons and purposes. The choice of when one uses public transportation depends upon accessibility to public transit, availability of other modes of transportation, and an individual's personal preferences among other things. Thus, while demographic and socioeconomic characteristics play a role in who is most likely to travel on public transit, these characteristics are not the sole motivators for taking public transportation. Still, while all eligible persons within public transit service areas may use public transportation, certain demographic groups are more likely to utilize public transit out of necessity – primarily those who cannot afford to maintain or who cannot physically operate a vehicle. Thus the disabled, the elderly, persons in zero-vehicle households and those in low income households are more likely to use public transportation than other groups. We therefore provide an overview of how demographic change may impact these four market segments. Methods for estimating local public transportation demand typically incorporate these four segments separately in demand models. We therefore estimate change for each of these segments separately, although we recognize that individuals may have characteristics that place them in more than one of these special populations (Transportation Research Board 1979, 1995). We follow our projections of these segments with alternative projections of commuter (i.e. worker) use of public transportation based upon changes in demographic composition and current rates of public transit use.

The journey-to-work continues to be the single most important generator of public transportation trips. According to the American Public Transportation Association, 59 percent of all transit trips are work related while 72 percent of all transit trips are taken by the employed (2007). For a variety of reasons, non-Anglo populations have higher rates of public transportation utilization than Anglos. If current rates of public transportation usage for 2000 continue, future commuter use of public transportation will increase due to population growth and shifts in the racial and ethnic composition of the Texas population. Consequently, changes in the degree to which non-Anglos utilize public transportation will impact future public transportation demand. After our projections of commuter use of public transportation and the four demographic segments, we explore the effects of alternative scenarios of convergence between non-Anglo and Anglo rates for commuter public transportation use and the four market segments previously projected. Because the traditional public transportation agencies which serve the needs of urban residents and commuters depend upon higher population densities to provide cost effective services, we conclude this chapter with a brief overview of the implications for transportation of changing population densities in selected Texas counties.

Change in Demographic Groups in Need of Public Transportation

Where it is available, people who live in zero-vehicle households are more likely to ride public transportation than any other group (Polzin and Chu 2005). In Texas, the percentage of households without vehicles has declined slightly since 1990. According to the American Community Survey, only 6.3 percent of all households did not own a vehicle in 2005. This was down slightly from 7.4 percent in 2000 and 8.1 percent in 1990 (Table 6-1). Much of the decline in the percentage of zero vehicle households has occurred due to decreases in the number of elderly households without vehicles. In all three periods (1990, 2000 and 2005) approximately 6 percent of all households with householders aged 16 to 64 had no vehicles present, whereas the share of households without vehicles headed by householders 65 and older declined from 17 percent in 1990 to 12.2 percent in 2005 (Table 6-1). Overall, 34.1 percent of zero vehicle households in 2000 were headed by persons age 65 and older. Because of the demographic structure of the population, these households were predominately Anglo, while zero vehicle households headed by persons younger than 65 were typically Hispanic or Black. Overall, in 2000, non-Anglo headed households are more likely to not own automobiles than are Anglo headed households. This phenomenon is more pronounced in the older ages where 25.8 percent of Hispanic headed households and 28.0 percent of Black headed households owned no vehicles compared to just 9.7 percent of Anglo headed households.

Table 6-1:
Vehicle Ownership by Age of Householder, 1990, 2000 and 2005

	1990		2000		2005	
Age, Number of Vehicles	**Number**	**%**	**Number**	**%**	**Number**	**%**
15 to 64 years:	4,933,504	100.0	6,057,776	100.0	6,621,405	100.0
None	295,776	6.0	361,290	6.0	334,805	5.1
1 or more	4,637,728	94.0	5,696,486	94.0	6,286,600	94.9
65 years and over:	1,137,433	100.0	1,335,578	100.0	1,356,690	100.0
None	193,472	17.0	186,835	14.0	165,313	12.2
1 or more	943,961	83.0	1,148,743	86.0	1,191,377	87.8
Total	6,070,937	100.0	7,393,354	100.0	7,978,095	100.0
None	489,248	8.1	548,125	7.4	500,118	6.3
1 or more	5,581,689	91.9	6,845,229	92.6	7,477,977	93.7

Source : U.S. Bureau of the Census, Census2000 and American Community Survey (2005)

Table 6-2:
Vehicle Ownership by Age of Householder and Race/Ethnicity, 2000

Age, Race/Ethnicity of Householder	Total Households	Without Vehicles	% Without Vehicles	% of Total Households	
				All	Without Vehicles
15 to 64 years:	6,057,776	361,290	6.0	81.9	65.9
Anglo	3,498,372	107,731	3.1	47.3	19.7
Black	708,263	98,407	13.9	9.6	18.0
Hispanic	1,585,431	140,152	8.8	21.4	25.6
Other	265,710	15,000	5.6	3.6	2.7
65 years and over:	1,335,578	186,835	14.0	18.1	34.1
Anglo	989,202	96,240	9.7	13.4	17.6
Black	122,169	34,253	28.0	1.7	6.2
Hispanic	201,710	52,116	25.8	2.7	9.5
Other	22,497	4,226	18.8	0.3	0.8
Total	***7,393,354***	***548,125***	***7.4***	***100.0***	***100.0***

Source: Derived from U.S. Census 2000, SF4 HCT33A-33I

Household growth and changes in the characteristics of Texas households will increase the number of zero vehicle households. In order to understand the magnitude of these potential changes, the 2000 rates of household vehicle ownership by age, sex, and race/ethnicity of householders were applied to household projections prepared by the Texas State Data Center and the Institute for Demographic and Socioeconomic Research at the University of Texas at San Antonio. These household projections (see Chapter 2) were derived from the population projections described in previous chapters, assuming 2000 householder rates by age, sex, and race/ethnicity. These 2000 rates are applied to the population projection scenarios which assume different rates of net migration by age, sex, and race/ethnicity. As in previous chapters, we provide an overview of the effects of these demographic changes by using two alternative projection scenarios: one assuming 1990 rates of net migration (high growth or 1.0 scenario) and one assuming 2000-2004 rates of net migration (moderate growth or 00-04 scenario). In a subsequent section of this chapter we examine the effects of alternative assumptions about rates of change in vehicle ownership rates on the aggregate number and percentage of zero vehicle households.

Under these assumptions, there will be a larger percentage of households without vehicles in 2040 than there are today and the total number of zero vehicle households will increase at slightly faster rates than the total number of households. By 2040, there will be between 1.7 and 2.0 million zero vehicle households. This is an increase of between 218.1 and 272.3 percent over the number of zero vehicle households in 2000. These rates of growth are substantially larger than the overall increase in the number of households (of 128 and 167 percent respectively). These increases would mean that 10.3 percent of all households, compared to 7.4 percent in 2000 and 6.1 percent in 2005 would not own a vehicle. In 2000, more than one third of zero vehicle households were headed by Anglo householders. Another third were headed by Hispanic householders, while a quarter were headed by Black householders. All racial and ethnic groups will see increases in the number of zero vehicle households under these assumptions; but due to differentials in rates of population growth, the overwhelming majority of new zero vehicle households will be headed by Hispanic householders in

2040, when almost 60 percent of all zero vehicle households will have a Hispanic householder (Table 6-3).

Public transportation also serves the needs of those who might not otherwise be able to drive due to physically limiting conditions. Measures of disability vary due to different definitions of disability and purposes of the surveys collecting the data. Persons with disabilities may or may not have driving limitations; however the number of persons with "Go-Outside-of-Home" Disabilities is often used as one measure of public transportation demand (Transportation Research Board 1979, 1995). The question on Census Bureau surveys asked of persons age 16 and older related to this statistic asks whether or not a person has "difficulty going outside the home alone to shop or visit a doctor." In Texas in 2005, approximately 4.9 percent or 755,170 people age 16 and older had difficulties going outside of the home alone. Concerned about misinterpretation of this question and a resulting over-reporting of out-of-home disabilities in the 2000 Census and pre-2003 American Community Surveys, the Census Bureau re-ordered disability related questions. Thus, post-2003 data on this measure are not comparable to those for 2000 due to a format change on disability questions on the American Community Survey which occurred in 2003 (Stern and Brault 2005). We therefore applied 2005 rates of out-of-home disabilities by age, sex and race/ethnicity to 2000 and projected populations to 2040. According to these assumptions, by 2040, between 2.3 and 2.7 million people will have difficulty going outside of their homes alone (Table 6-4). This is more than double the estimated number of persons with out-of-home disabilities in 2000, or a numerical increase of between 1.6 and 2.0 million persons. Over 50 percent of disabled individuals in 2040 will be Hispanic (compared to just 25 percent in 2000), while the percentage that are Anglo will change from 57.4 percent of the total in 2000 to 26.1 percent of the total out-of-home disabled population in 2040.

Much of the growth in the out-of-home disabled population will be due to a growing elderly population with the increases in the elderly population being between 277 and 334 percent from 2000 to 2040. However, under these scenarios, the number of out-of-home disabled age 16 to 64 will also increase at faster rates than the population as a whole. The total number of individuals with out-of-home disabilities age 16 to 64 will show increases between 141.0 and 181.8 percent between 2000 and 2040 compared to population increases of 109 to 148 percent (Table 6-5). Over 60 percent of the net growth in this disabled population will be attributed to the Hispanic population, followed by older Anglos and older persons of Other racial and ethnic origins (13.5 percent and 12.2 percent, respectively – Figure 6-1).

Table 6-3:
Number of Zero Vehicle Households by Race/Ethnicity of Householder, 2000-2040
Assuming Same Rates of Vehicle Ownership by Age, Sex and Race/Ethnicity
of Householder for 2000 Using Alternative Population Projection Scenarios

Population Projection Scenario 1.0

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	204,390	37.5	134,019	24.6	191,855	35.2	14,321	2.6	544,585	100.0
2010	227,994	30.8	169,556	22.9	312,992	42.3	29,628	4.0	740,170	100.0
2020	267,222	25.4	218,910	20.8	507,648	48.2	58,364	5.5	1,052,144	100.0
2030	304,762	20.5	273,312	18.4	799,680	53.8	107,482	7.2	1,485,236	100.0
2040	312,904	15.4	315,879	15.6	1,212,874	59.8	185,818	9.2	2,027,475	100.0
	Numeric and Percentage Change									
2000-10	23,604	11.5	35,537	26.5	121,137	63.1	15,307	106.9	195,585	35.9
2010-20	39,228	17.2	49,354	29.1	194,656	62.2	28,736	97.0	311,974	42.1
2020-30	37,540	14.0	54,402	24.9	292,032	57.5	49,118	84.2	433,092	41.2
2030-40	8,142	2.7	42,567	15.6	413,194	51.7	78,336	72.9	542,239	36.5
2000-40	108,514	53.1	181,860	135.7	1,021,019	532.2	171,497	1,197.5	1,482,890	272.3

Population Projection Scenario 00-04

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	204,390	37.5	134,019	24.6	191,855	35.2	14,321	2.6	544,585	100.0
2010	219,994	30.8	163,704	22.9	302,639	42.3	28,483	4.0	714,820	100.0
2020	248,988	25.5	203,429	20.8	470,841	48.2	53,450	5.5	976,708	100.0
2030	274,510	20.8	244,311	18.5	709,730	53.7	94,039	7.1	1,322,590	100.0
2040	272,665	15.7	271,317	15.7	1,032,467	59.6	155,780	9.0	1,732,229	100.0
	Numeric and Percentage Change									
2000-10	15,604	7.6	29,685	22.1	110,784	57.7	14,162	98.9	170,235	31.3
2010-20	28,994	13.2	39,725	24.3	168,202	55.6	24,967	87.7	261,888	36.6
2020-30	25,522	10.3	40,882	20.1	238,889	50.7	40,589	75.9	345,882	35.4
2030-40	-1,845	-0.7	27,006	11.1	322,737	45.5	61,741	65.7	409,639	31.0
2000-40	68,275	33.4	137,298	102.4	840,612	438.1	141,459	987.8	1,187,644	218.1

Derived from U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 6-4:
Projected Number of Persons Age 16 and Older with Out-of-Home Disability by Race/Ethnicity, 2000-2040 Assuming the Same Rates of Out-of-Home Disability by Age, Sex, and Race/Ethnicity as in 2005 and Using Alternative Population Projection Scenarios

Population Projection Scenario 1.0

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	433,379	57.4	108,868	14.4	192,557	25.5	20,366	2.7	755,170	100.0
2010	496,840	49.9	142,287	14.3	311,614	31.3	45,265	4.5	996,006	100.0
2020	591,376	42.2	190,573	13.6	520,851	37.2	99,033	7.1	1,401,833	100.0
2030	683,583	34.4	249,717	12.5	864,967	43.5	191,576	9.6	1,989,843	100.0
2040	706,666	26.1	297,402	11.0	1,365,621	50.4	341,637	12.6	2,711,326	100.0
	Numeric and Percentage Change									
2000-10	63,461	14.6	33,419	30.7	119,057	61.8	24,899	122.3	240,836	31.9
2010-20	94,536	19.0	48,286	33.9	209,237	67.1	53,768	118.8	405,827	40.7
2020-30	92,207	15.6	59,144	31.0	344,116	66.1	92,543	93.4	588,010	41.9
2030-40	23,083	3.4	47,685	19.1	500,654	57.9	150,061	78.3	721,483	36.3
2000-40	273,287	63.1	188,534	173.2	1,173,064	609.2	321,271	1,577.5	1,956,156	259.0

Population Projection Scenario 00-04

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	433,379	57.4	108,868	14.4	192,557	25.5	20,366	2.7	755,170	100.0
2010	479,574	49.9	137,640	14.3	300,479	31.3	43,392	4.5	961,085	100.0
2020	551,617	42.3	177,670	13.6	484,048	37.1	90,327	6.9	1,303,662	100.0
2030	615,946	34.5	224,695	12.6	774,903	43.5	167,721	9.4	1,783,265	100.0
2040	615,538	26.3	257,550	11.0	1,178,702	50.4	287,678	12.3	2,339,468	100.0
	Numeric and Percentage Change									
2000-10	46,195	10.7	28,772	26.4	107,922	56.0	23,026	113.1	205,915	27.3
2010-20	72,043	15.0	40,030	29.1	183,569	61.1	46,935	108.2	342,577	35.6
2020-30	64,329	11.7	47,025	26.5	290,855	60.1	77,394	85.7	479,603	36.8
2030-40	-408	-0.1	32,855	14.6	403,799	52.1	119,957	71.5	556,203	31.2
2000-40	182,159	42.0	148,682	136.6	986,145	512.1	267,312	1,312.5	1,584,298	209.8

Derived from U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

Table 6-5:
Projected Number of Persons, Age 16 to 64 with Out-of-Home Disability by Race/Ethnicity, 2000-2040 Assuming the Same Rates of Out-of-Home Disability by Age, Sex and Race/Ethnicity as in 2005 and Using Alternative Population Projection Scenarios

Population Projection Scenario 1.0

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	191,842	51.5	63,022	16.9	103,608	27.8	13,747	3.7	372,219	100.0
2010	217,231	42.9	86,292	17.0	176,315	34.8	26,725	5.3	506,563	100.0
2020	213,173	33.3	101,772	15.9	279,274	43.6	46,529	7.3	640,748	100.0
2030	200,189	24.7	111,390	13.7	428,551	52.9	70,502	8.7	810,632	100.0
2040	201,093	19.2	127,074	12.1	623,763	59.5	97,075	9.3	1,049,005	100.0
	Numeric and Percentage Change									
2000-10	25,389	13.2	23,270	36.9	72,707	70.2	12,978	94.4	134,344	36.1
2010-20	-4,058	-1.9	15,480	17.9	102,959	58.4	19,804	74.1	134,185	26.5
2020-30	-12,984	-6.1	9,618	9.5	149,277	53.5	23,973	51.5	169,884	26.5
2030-40	904	0.5	15,684	14.1	195,212	45.6	26,573	37.7	238,373	29.4
2000-40	9,251	4.8	64,052	101.6	520,155	502.0	83,328	606.2	676,786	181.8

Population Projection Scenario 00-04

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	191,842	51.5	63,022	16.9	103,608	27.8	13,747	3.7	372,219	100.0
2010	209,954	42.9	83,330	17.0	169,886	34.7	25,761	5.3	488,931	100.0
2020	199,416	33.4	94,527	15.8	260,417	43.6	43,239	7.2	597,599	100.0
2030	181,252	24.9	99,397	13.6	384,507	52.8	63,172	8.7	728,328	100.0
2040	176,165	19.6	108,870	12.1	528,342	58.9	83,517	9.3	896,894	100.0
	Numeric and Percentage Change									
2000-10	18,112	9.4	20,308	32.2	66,278	64.0	12,014	87.4	116,712	31.4
2010-20	-10,538	-5.0	11,197	13.4	90,531	53.3	17,478	67.8	108,668	22.2
2020-30	-18,164	-9.1	4,870	5.2	124,090	47.7	19,933	46.1	130,729	21.9
2030-40	-5,087	-2.8	9,473	9.5	143,835	37.4	20,345	32.2	168,566	23.1
2000-40	-15,677	-8.2	45,848	72.7	424,734	409.9	69,770	507.5	524,675	141.0

Derived from U.S. Bureau of the Census; Texas State Data Center Estimates and Projections Program

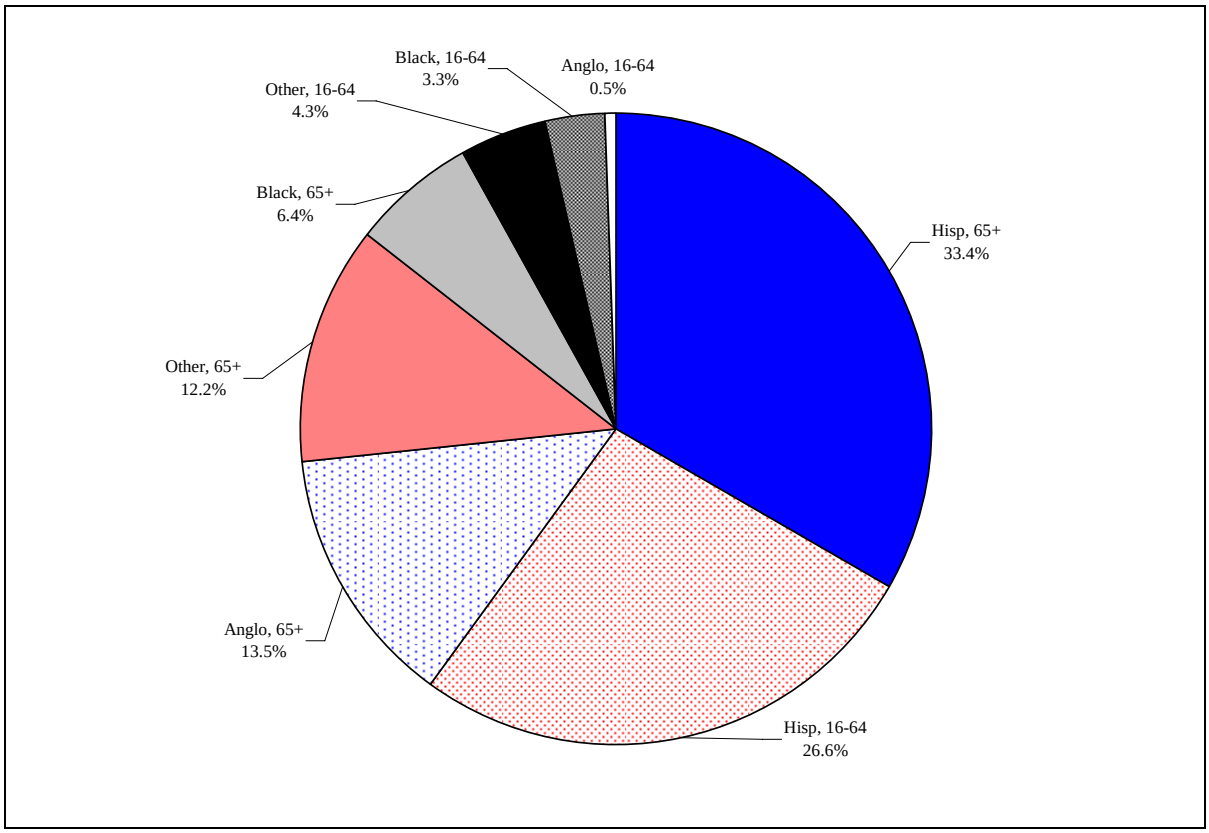

Figure 6-1: Percent of 2000-2040 Change in Out-Of-Home Disabled Population Attributed to Each Racial/Ethnic and Age Group (Population Projection Scenario 1.0)

Projections of Commuters Using Public Transportation

For a variety of reasons (e.g., lower rates of access to privately-owned vehicles, more limited incomes to pay for transportation, etc.), non-Anglos utilize public transportation at higher rates than Anglos. Due to changes in the demographic composition of the Texas population, we expect that there will be an increasing demand for public transportation if current rates of use continue in the future. Projections of the labor force were obtained from the Texas State Data Center at the University of Texas at San Antonio (see Chapter 7). These are prepared by multiplying labor force participation rates by age, sex, and race/ethnicity from the 2000 Census to the alternative population projections. The resulting projections include estimates of all persons in the civilian labor force, whether or not they are employed. In order to estimate rates for this transportation mode choice, the number of workers by age, sex, and race/ethnicity using public transportation on their journey-to-work was divided by the total number of persons in the labor force by each combination of age, sex and race/ethnicity to obtain age, sex, and race/ethnicity specific rates of public transportation use in the labor force. These rates were then applied to the projections of the total labor force. The results provide an estimate of future demand for public transportation on the journey-to-work based upon changes in demographic composition alone, not accounting for differences in service availability.

Under current rates, the total number of public transit riders on the journey-to-work will increase from 162,000 in 2000 to between 417,000 and 497,000 depending upon the labor force projection scenario (Table 6-6). Because of lower use rates and slower population growth, the number of Anglo riders will increase only slightly between 2000 and 2040 under scenario 1.0 and decline under the more moderate projection scenario (00-04). The largest percentage growth in riders will be due to increases in Hispanic workers. Hispanic workers accounted for 65,000 riders or 39.9

percent of the public transit journey-to-work commuters in 2000 but will increase to between 271,000 and 327,000 and over 65 percent of total riders by 2040. Under current rates, overall growth in workers using public transportation for their journey-to-work commute will increase by between 156.7 and 206.4 percent.

Table 6-6:
Projected Number of Commuters Using Public Transportation

	Anglo		Black		Hispanic		Other		Total	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
Population Projection Scenario 1.0										
2000	41,486	25.5	47,733	29.4	64,761	39.9	8,486	5.2	162,466	100.0
2010	43,405	19.6	58,828	26.6	104,383	47.2	14,316	6.5	220,932	100.0
2020	42,368	14.6	67,072	23.1	157,980	54.5	22,415	7.7	289,835	100.0
2030	41,852	10.9	75,287	19.7	232,374	60.7	33,293	8.7	382,806	100.0
2040	41,562	8.4	82,420	16.6	326,949	65.7	46,795	9.4	497,726	100.0
Numeric and Percentage Change										
	Num.	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000-10	1,919	4.6	11,095	23.2	39,622	61.2	5,830	68.7	58,466	36.0
2010-20	-1,037	-2.4	8,244	14.0	53,597	51.3	8,099	56.6	68,903	31.2
2020-30	-516	-1.2	8,215	12.2	74,394	47.1	10,878	48.5	92,971	32.1
2030-40	-290	-0.7	7,133	9.5	94,575	40.7	13,502	40.6	114,920	30.0
2000-40	76	0.2	34,687	72.7	262,188	404.9	38,309	451.4	335,260	206.4
Population Projection Scenario 00-04										
	Anglo		**Black**		**Hispanic**		**Other**		**Total**	
Year	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000	41,486	25.5	47,733	29.4	64,761	39.9	8,486	5.2	162,466	100.0
2010	41,925	19.7	56,730	26.7	100,293	47.1	13,851	6.5	212,799	100.0
2020	39,620	14.8	62,074	23.2	145,121	54.2	20,735	7.7	267,550	100.0
2030	37,970	11.2	66,889	19.8	203,472	60.2	29,439	8.7	337,770	100.0
2040	36,606	8.8	70,125	16.8	270,891	65.0	39,390	9.4	417,012	100.0
Numeric and Percentage Change										
	Num.	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**	**Num.**	**%**
2000-10	439	1.1	8,997	18.8	35,532	54.9	5,365	63.2	50,333	31.0
2010-20	-2,305	-5.5	5,344	9.4	44,828	44.7	6,884	49.7	54,751	25.7
2020-30	-1,650	-4.2	4,815	7.8	58,351	40.2	8,704	42.0	70,220	26.2
2030-40	-1,364	-3.6	3,236	4.8	67,419	33.1	9,951	33.8	79,242	23.5
2000-40	-4,880	-11.8	22,392	46.9	206,130	318.3	30,904	364.2	254,546	156.7

Source: Derived from U.S. Bureau of the Census; Texas State Date Center Estimates and Projections Program

Implications of Alternate Assumptions About Public Transportation Use and Need

Due to a variety of historical, discriminatory and other factors, non-Anglos are more likely to live in low income households and own no vehicles than Anglos and are therefore more likely to depend upon alternatives to single occupancy vehicles – including carpooling and public transportation. If the socioeconomic status of non-Anglos improve, then these racial/ethnic groups are likely to adapt the travel behaviors of Anglos and use public transportation less. In order to understand the potential impacts to commuter transit demand due to changes in mode choice among non-Anglo workers, we prepared two additional scenarios. The first scenario assumed that the differential between the rates of transit use among non-Anglo workers (journey-to-work) closes to one-half the rates of Anglo workers by 2020. The second scenario assumes a full closure of the differential between these two groups by 2020 so that non-Anglo rates become identical to those for Anglos. In the interest of space, the scenarios shown here are for the population/labor force projection that assumes 1990s rates of net migration by age, sex and race/ethnicity (Scenario 1.0). The results of these two additional scenarios and the one that assumes current rates of public transit usage are shown in Figure 6-2 and Table 6-7.

If current rates of transit use continue, then the number of commuters using public transportation on their journey-to-work will increase by 206.4 percent between 2000 and 2040 (see Item 1, Table 6-7). If non-Anglo workers began to choose transportation modes similar to those used by Anglos, the growth over this forty year period could be cut in half to 106.0 percent (assuming that the difference in the rates of use of public transportation by non-Anglos is cut to one-half that of Anglos by 2020). And in the most extreme example, if non-Anglo workers began to use public transit less and at the same rates of Anglo workers, the demand for public transportation for the daily work commute will decline slightly in the near term and increase only marginally (5.6 percent) between 2000 and 2040. These significant differences highlight the importance of public transportation services for non-Anglo groups today along with the resulting consequences of changes in mode choice for public transportation demand.

Projections utilizing similar assumptions about closures of rates between Anglos and non-Anglos were prepared for the projections of Zero-Vehicle Households and Out-of-Home Disabled. The differences in rates for these items are not as extreme as those found for the alternative projections of public transportation use; however, closures in the rate differentials for these two items will still effect the overall growth in these two characteristics of households and the population and have implications for public transportation demand. Item 2 in Table 6-7 shows how changes in vehicle ownership rates could effect the change in the number of zero-vehicle households. Given the 2000 rates of vehicle ownership by race and ethnicity of the householder, there will be 2.0 million households without vehicles in 2040 (10.3 percent of total households). This compares to 545,000 households in 2000 (or 7.4 percent of all households). If the differential in the rates of vehicle ownership between non-Anglo and Anglo headed households disappeared by 2020, there would still be an increase of 71.2 percent in the number of zero vehicle households between 2000 and 2040, to a total 932,000 households (or 4.7 percent of all households).

Under all scenarios (including the base case), the number of disabled will more than double (see Item 3, Table 6-7). In the most extreme case, if disability rates for non-Anglos became the same as those of Anglos in 2000 by 2020 (i.e. full closure), then the number of out-of-home disabled will increase from 755,170 to 2.1 million by 2040. This 184.3 percent increase is below the 259.0 percent increase assuming current rates prevail throughout the projection period.

Obviously there is a tradeoff related to such services; that is those not using public forms of transit are likely to use private vehicles to fill their transportation needs resulting in additional demands on Texas highways. The impacts of the closure noted above should thus be seen in light of the likely impacts of such closure on increased demands on highways. Unfortunately it is not

possible to fully delineate the impacts of this tradeoff but it must be noted in examining the affects of any changes in transit on transportation infrastructure.

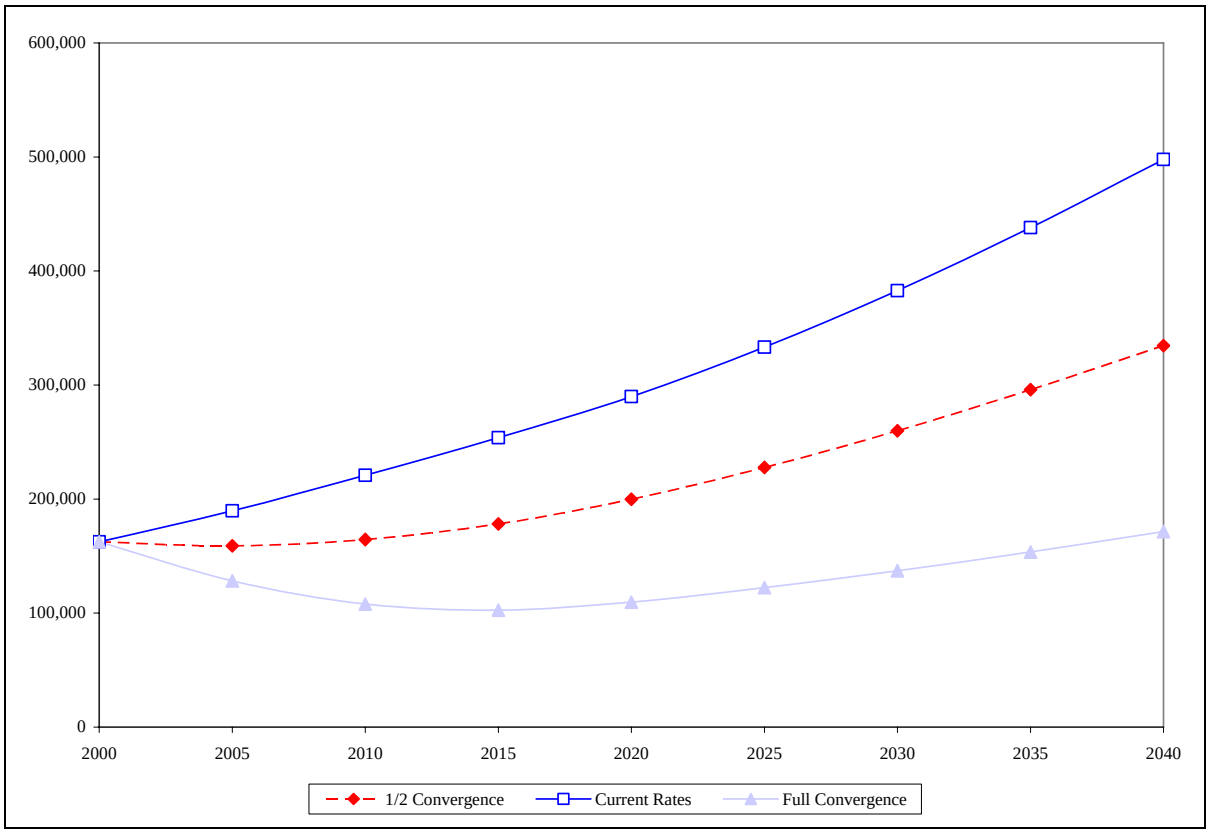

Figure 6-2: Number of Commuters Using Public Transportation by Year Assuming Alternative Assumptions about Changes in Public Transit Use Rates, 2000-2040

Table 6-7:
Projections of Selected Factors Using Alternative Assumptions About Non-Anglo and Anglo Convergence in Rates

Item	Numbers by Year					Percent Change 2000-40
	2000	2010	2020	2030	2040	
1. Commuter Public Transit Riders						
Base Rates	162,466	220,932	289,835	382,806	497,726	206.4
Half Closure	162,466	164,471	199,738	259,956	334,600	106.0
Full Closure	162,466	108,010	109,633	137,101	171,484	5.6
2. Zero Vehicle Households						
Base Rates	544,585	740,170	1,052,144	1,485,236	2,027,475	272.3
Half Closure	544,585	592,874	794,093	1,103,294	1,479,794	171.7
Full Closure	544,585	445,576	536,043	721,353	932,113	71.2
3. Out-of-Home Disabled						
Base Rates	755,170	996,006	1,404,833	1,989,843	2,711,326	259.0
Half Closure	755,170	977,657	1,289,803	1,807,287	2,429,234	221.7
Full Closure	755,170	959,308	1,177,771	1,624,731	2,147,147	184.3

Source : Derived from U.S. Bureau of the Census; Texas State Data Center Estimates & Projections Program

Population Change in Transit Serving Urban Areas

As metropolitan areas increase in size and greater proportions of the Texas population locate in these areas, the need for public transportation services will increase due to individuals seeking alternatives to single occupancy vehicles and as policy makers seek ways to relieve traffic congestion. Eight Metropolitan Transit Authorities (MTAs) serve the largest urban areas (those consisting of 200,000 or more people). Cities served by MTAs include Austin, Corpus Christi, Dallas, Denton-Lewisville, El Paso, Fort Worth, Houston, and San Antonio. Small urban transit systems serve two additional large cities (Arlington and McAllen) as well as 29 smaller urban areas (population sized 50,000 to 200,000). In all, cities in 29 counties are served by one or more small urban transit systems or MTAs. Rural transit systems serve the remaining areas of the State so that all but two counties are served by some form of public transportation.

We provide a brief overview of changes in population density for selected urban counties in order to identify areas where public transportation services may need to be expanded in the long term. Transit funding is partly dependent upon the size of urbanized areas as delineated according to population densities by the U.S. Bureau of the Census and the Office of Management and Budget. Because these designated urbanized areas change from decennial census to decennial census and because these are based upon smaller, sub-county areas, it would be difficult to anticipate the changes in these urbanized areas. In order to highlight potential counties where public transportation funding may become available as areas meet population thresholds (under current funding mechanisms), we provide a brief overview of changes in population densities of the most populated counties. Although urbanized areas do not include all areas within a county, changes in densities of counties serve as a proxy for these urbanized areas in order to uncover places with the potential for developing or expanding public transportation systems in the future. The fifteen most densely populated counties for 2040 are shown in Figure 6-3 assuming that the 1990s trends continue (population projection scenario 1.0). Out of these fifteen, four are not currently served by an urban transit system or MTA.

These include Rockwall County (DFW MSA), Fort Bend County (Houston-Galveston MSA) and Hays and Williamson Counties (Austin-Round Rock MSA). Of these four, the county with the smallest population density (Hays at 846.5 people per square mile) will be larger than that of Denton County in 2006 (which includes the newest urbanized area with a MTA designation).

Urban public transit providers depend upon higher densities in order to sufficiently operate fixed route services. Increasing densities will improve the opportunities for developing public transportation systems. Dallas County has the highest population density of any county in the State (at 2,665.7 people per square mile in 2006). Under this population projection scenario, five counties will have population densities higher than Dallas County today. These counties include Collin, Dallas, Denton, and Tarrant Counties in the DFW metropolitan area along with Harris County in Houston. Of these, only Collin County does not have a metropolitan transit authority located within its boundaries today (and Denton County is newly designated). Under population projection scenario 1.0, by 2040 Dallas County will remain the county with the highest population density (at 6,590.0 people per square mile). By comparison, as shown in Figure 6-3, Dallas County will have a higher population density in 2040 than Cooke County, Illinois (Chicago) today. With continued concentration of the population in large urban areas along with increases in populations with special needs (i.e. those living in zero vehicle households and the disabled among others) there will be opportunities for expansions of existing and creation of new public transit systems.

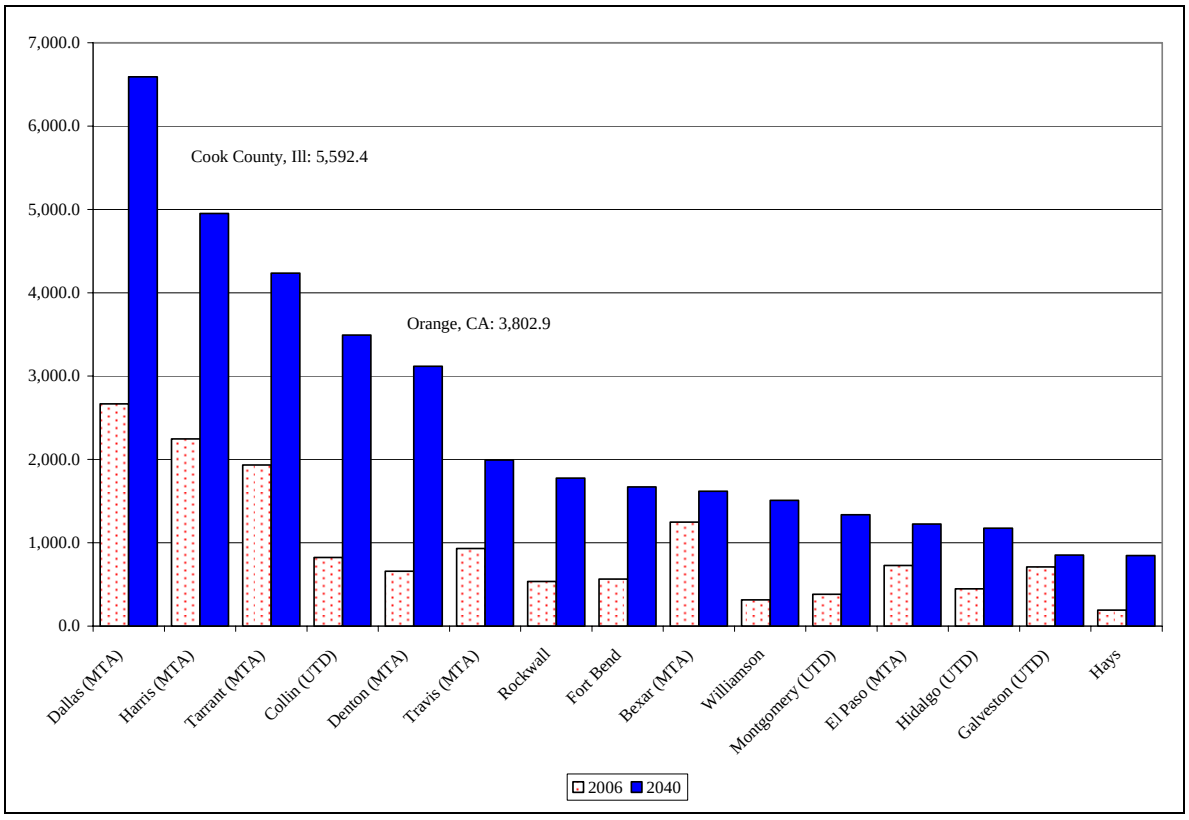

Figure 6-3: Change in Population Density of 15 Largest Texas Counties, 2006-2040

Conclusion

Continued population growth in urban areas may increase the need for individuals and policy makers to seek out alternatives to single occupancy vehicles in order to avoid and alleviate traffic congestion. Increased population densities of urban counties may improve the potential for fixed route services in new areas and expansions in existing ones as several new areas meet criteria for funding and densities that make fixed route transit more viable. In addition to population growth, changes in the racial and ethnic composition of the population and increases in the population 65 and older may also impact demand for public transit services, including those in non-metropolitan areas. We highlight a few of the implications of these changes below:

1. ***Increases in households without vehicles.*** Under these projection scenarios, between 1.7 and 2.0 million households will not own a vehicle in 2040. The increase in the number of zero vehicle households (between 218 and 272 percent) will surpass total household growth (of between 128 and 167 percent). Thus an estimated 10 percent of all households will not own a vehicle in 2040. However, recent changes have indicated increases in vehicle ownership. Assuming that all households share the same vehicle ownership rates as those of Anglo households in 2000, there will still be 900,000 households without vehicles in 2040 (or a 71 percent increase).

2. ***Increases in the number of disabled people.*** Under all scenarios presented in this chapter, the numbers of people with "out-of-home" disabilities will more than double to from between 2.3 and 2.7 million people by 2040. Even under the most conservative scenario (assuming the same disability rates of Anglos for the entire population), there will be an increase of 184 percent to 2.1 million in 2040.

3. ***Increases in the number of workers commuting on public transportation.*** As the Texas population becomes more racially and ethnically diverse, there is a potential for increased commuter demand for public transportation services given current rates of transportation use of non-Anglo groups. However, as this chapter has shown, the variability in the projections is more prominent than all other items projected here. Meaning, changes in the transportation mode choices of these groups will have a substantial impact on public transit demand. Should non-Anglo groups utilize public transportation at the same rates as Anglos in 2000, then the growth in public transportation demand on the journey-to-work would be only 6 percent from 2000 to 2040 – to a total of 171,000 in 2040. By comparison, given current rates of public transportation use, there will be 417,000 to 497,000 transit riders in 2040 (from 162,000 today).

Chapter 7

Implications of Population Change for the TxDOT Workforce

The population growth and the increasing diversification of the population of Texas noted in the preceding chapters have significant implications for TxDOT both in terms of the size and characteristics of the labor force from which it will draw a majority of its employees and relative to its need to have a labor force that reflects the population of Texas. At the same time, the aging of the population and the large number of all Texas State employees, including TxDOT employees, who are part of the large baby-boom cohort which will retire in large numbers over the coming years will provide additional challenges for the maintenance of TxDOT's professional and technical workforce. In sum, these are human resource issues that will impact TxDOT both internally and externally.

In this chapter we examine the implications of changes in the population for the labor force supply in Texas, examine the current characteristics of the TxDOT labor force and project challenges likely to be brought about in filling TxDOT's future workforce needs as a result of demographic changes in the labor force.

The Future Labor Force of Texas

Table 7.1 shows change in the Texas and U.S. labor forces from 1980 to 2000. When compared to population change for the same periods the comparison shows the clear effects of the changing age structure. Thus the Texas labor force increased by 25 percent from 1980 to 1990 while the population increased by 19.4 percent but in the 1990s the labor force increased by 19.6 percent while the population increased by 22.4 percent. This shift resulted from the fact that the 1980s witnessed the last years of initial labor force entrance of the large baby-boom generation while the decade of the 1990s showed rates of labor force entrance that reflected the much smaller baby-bust cohort. Both the size and rate of growth in the labor force reflect demographic factors.

Tables 7-2 through 7-5 provide data on the projected labor force in Texas under the two population projection scenarios utilized in the previous sections of this volume. Projections of the labor force were completed by multiplying 2000 age, sex, and race/ethnicity specific labor force participation rates by the projected populations in each age, sex, and race/ethnicity cohort. The projections thus assume that age, sex, and race/ethnicity specific labor force participation rates remain constant during the projection period.

These data suggest that the labor force will change in ways reflecting population change. Under the 1.0 scenario, the population increases by 148 percent from 2000 to 2040 while the labor force increases by nearly 142 percent while under the 00-04 scenario the population increases by 109 percent and the labor force by about 104 percent (see Table 7-3). Similarly, rates of increase in the labor force are greater for non-Anglo groups than for Anglos with the number of Anglos actually declining under the 00-04 scenario and increasing by only 3 percent under the 1.0 scenario while the number of Hispanics in the labor force increase by more than 300 percent under both scenarios. Similarly, as for the population, by 2040 when the population projections suggest that the population will be about 24 to 25 percent Anglo, 8 percent African-American, 58 to 59 percent Hispanic, and about 8 percent will be members of Other racial/ethnic groups. The data on the labor force (see Table 7-4) suggest that the labor force will be approximately 25 to 26 percent Anglo, 8 percent African-American, 58 to 59 percent Hispanic,

and 8 percent members of Other racial/ethnic groups. Overall, under the 1.0 scenario nearly 99 percent, and under the 00-04 scenario all of the net increase in the labor force will be attributable to the non-Anglo population (see Table 7-5). Change in the labor force of Texas will reflect change in the population becoming larger and increasingly diverse. The challenge for TxDOT will be that of meeting its labor force needs while attaining a workforce that reflects the population of Texas.

Table 7-1:
Civilian Labor Force in the United States and Texas, 1980-2000

Civilian Labor Force	1980	1990	2000	Percent Change 1980-1990	1900-2000	1980-2000
United States	104,449,817	123,478,450	137,668,798	18.2	11.5	31.8
Texas	6,574,676	8,219,028	9,830,559	25.0	19.6	49.5

Sources: U.S. Bureau of the Census, Census 2000 Summary File 3, [machine readable files], 2002; Census of Population and Housing, 1990: Summary Tape File 3, [machine readable files], 1991; and Census of Population and Housing, 1980: Summary Tape File 3, [machine readable data files], 1983.

Table 7-2:
Civilian Labor Force in Texas by Race/Ethnicity in 2000 and Projections to 2040 Assuming Alternative Projection Scenarios

Year	Anglo	Black	Hispanic	Other	Total
Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)					
2000	5,741,765	1,053,552	2,700,075	335,167	9,830,559
2010	6,036,401	1,320,503	4,394,252	582,240	12,333,396
2020	6,001,813	1,539,951	6,720,285	915,694	15,177,743
2030	5,944,491	1,723,492	9,917,817	1,364,127	18,949,927
2040	5,913,116	1,903,400	13,980,311	1,958,532	23,755,359
Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)					
2000	5,741,765	1,053,552	2,700,075	335,167	9,830,559
2010	5,829,353	1,273,616	4,232,721	563,354	11,899,044
2020	5,609,555	1,426,064	6,193,837	850,213	14,079,669
2030	5,389,445	1,530,937	8,707,155	1,210,848	16,838,385
2040	5,202,626	1,621,148	11,609,376	1,649,644	20,082,794

Source: Derived from Texas Population Estimates and Projections Program; U.S. Bureau of the Census, Census of Population, 2000

Table 7-3:
Percent Change in Projected Civilian Labor Force in Texas by Race/Ethnicity Assuming Alternative Projection Scenarios, 2000-2040

Year	Anglo	Black	Hispanic	Other	Total
Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)					
2000-2010	5.1	25.3	62.7	73.7	25.5
2010-2020	-0.6	16.6	52.9	57.3	23.1
2020-2030	-1.0	11.9	47.6	49.0	24.9
2030-2040	-0.5	10.4	41.0	43.6	25.4
2000-2040	3.0	80.7	417.8	484.3	141.6
Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)					
2000-2010	1.5	20.9	56.8	68.1	21.0
2010-2020	-3.8	12.0	46.3	50.9	18.3
2020-2030	-3.9	7.4	40.6	42.4	19.6
2030-2040	-3.5	5.9	33.3	36.2	19.3
2000-2040	-9.4	53.9	330.0	392.2	104.3

Source: Derived from Texas Population Estimates and Projections Program, U.S. Bureau of the Census

Table 7-4:
Percent of Civilian Labor Force in Texas by Race/Ethnicity in 2000 and Projections to 2040 Assuming Alternative Projection Scenarios

Year	Anglo	Black	Hispanic	Other
2000	58.4	10.7	27.5	3.4
Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)				
2010	48.9	10.7	35.6	4.7
2020	39.5	10.1	44.3	6.0
2030	31.4	9.1	52.3	7.2
2040	24.9	8.0	58.9	8.2
Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)				
2010	49.0	10.7	35.6	4.7
2020	39.8	10.1	44.0	6.0
2030	32.0	9.1	51.7	7.2
2040	25.9	8.1	57.8	8.2

Source: Derived from Texas Population Estimates and Projections Program; U.S. Bureau of the Census, Census of Population, 2000

Table 7-5:
Number and Percent of Net Change in the Civilian Labor Force in Texas Due to Each Race/Ethnicity Group, Assuming Alternative Projection Scenarios, 2000-2040

Race/ Ethnicity	Number	Percent
Assuming Rates of Net Migration Equal to 1990-2000 (1.0 Scenario)		
Anglo	171,351	1.2
Black	849,848	6.1
Hispanic	11,280,236	81.0
Other	1,623,365	11.7
Total	***13,924,800***	***100.0***
Assuming Rates of Net Migration Equal to 2000-2004 (00-04 Scenario)		
Anglo	-539,139	-5.2
Black	567,596	5.5
Hispanic	8,909,301	86.9
Other	1,314,477	12.8
Total	***10,252,235***	***100.0***

Source: Derived from Texas Population Estimates and Projections Program, U.S. Bureau of the Census

The Technical Challenge

For TxDOT as for many agencies and companies with significant professional and technical staffs the challenge is much more than simply one of hiring enough people. Many of its staff must have engineering and technical skills that allow them to perform key technical functions. Although the number and diversity of graduates in these programs are increasing it is not at all clear that the rate of growth and diversification will be sufficiently rapid to meet demand. One indication of the technical challenge can be seen by examining the data in Table 7-6 which shows the number of engineering graduates in Texas over the past decade by their demographic characteristics.

The data show an increase of 11 percent in the number of engineering graduates and an approximately 6 percent proportional increase in the percentage of all engineering graduates who are non-Anglos. The growth in the number of women graduates is particularly large (although on small bases in some cases) with the percentage increase in the number of women graduates being roughly six times that for males. Despite such gains, the engineering workforce in Texas has been growing at about one-half the rate of increase in the labor force and the level of diversification among engineers is significantly less than for the labor force or population. Although TxDOT is not restricted to hiring Texas graduates, the divergence between the labor force and engineering graduates clearly suggest that meeting the technical needs of the agency while at the same time obtaining a workforce that reflects the population or labor force of Texas may be particularly challenging.

Table 7-6:
Engineering Graduates in Texas by Race/Ethnicity and Gender for 1995, 2000, and 2005 and Numeric and Percent Change (Bachelor's Degree)

Race/Ethnicity and Sex	Year						Change			
	1995		2000		2005		2000-2005		1995-2005	
	Num	%	Num	%	Num	%	Num	%	Num	%
Anglo	2,166	66.9	2,016	62.3	2,188	60.9	172	8.5	22	1.0
Male	1,837	56.7	1,614	49.9	1,783	49.7	169	10.5	-54	-2.9
Female	329	10.2	402	12.4	405	11.3	3	0.7	76	23.1
Black	183	5.6	165	5.1	195	5.4	30	18.2	12	6.6
Male	125	3.9	101	3.1	130	3.6	29	28.7	5	4.0
Female	58	1.8	64	2.0	65	1.8	1	1.6	7	12.1
Hispanic	497	15.3	563	17.4	649	18.1	86	15.3	152	30.6
Male	387	11.9	439	13.6	508	14.1	69	15.7	121	31.3
Female	110	3.4	124	3.8	141	3.9	17	13.7	31	28.2
Other	393	12.1	493	15.2	559	15.6	66	13.4	166	42.2
Male	305	9.4	375	11.6	400	11.1	25	6.7	95	31.1
Female	88	2.7	118	3.6	159	4.4	41	34.7	71	80.7
Total	**3,239**	**100.0**	**3,237**	**100.0**	**3,591**	**100.0**	**354**	**10.9**	**352**	**10.9**
Male	**2,654**	**81.9**	**2,529**	**78.1**	**2,821**	**78.6**	**292**	**11.5**	**167**	**6.3**
Female	**585**	**18.1**	**708**	**21.9**	**770**	**21.4**	**62**	**8.8**	**185**	**31.6**

Source: National Science Foundation WebCASPAR Integrated Science & Engineering Resources Data System

The Current TxDOT Labor Force

What are the characteristics of the current TxDOT workforce? As of February 28, 2006 TxDOT employed an estimated 14,700 people in its 20 divisions and 7 offices, including its 25 district offices. Approximately 24 percent (3,535) of the workforce was female and 76 percent (11,165) was male (TxDOT, 2006). Figure 7-1 illustrates that most of TxDOT's female workers are employed in the professional (50.3 percent of TxDOT's female employees), technician (22.9 percent of TxDOT's female employees), and administrative support (22.5 percent of TxDOT's female employees) job categories.

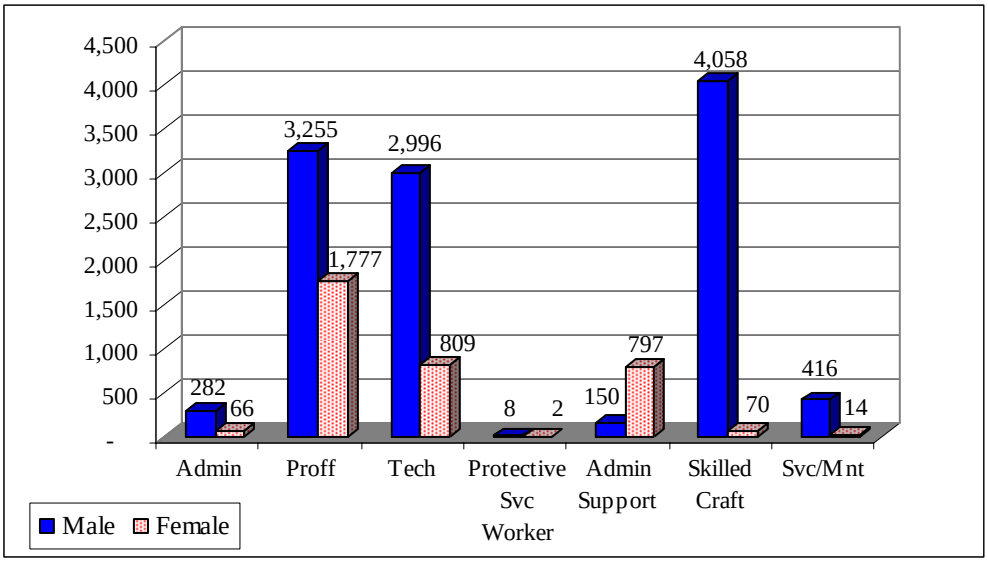

Figure 7-1: Number of Male and Female TxDOT Employees by Job Category (as of February 28, 2006)
Source: TxDOT, 2006

Figure 7-2 illustrates the diversity profile of the TxDOT workforce. As is evident from this figure, an estimated one third of TxDOT's employees are non-Anglo. Of the total number of non-Anglos employed by TxDOT, 31 percent are employed in the professional category, 30 percent in the skilled craft job category, and 26 percent in the technician category (TxDOT, 2006).

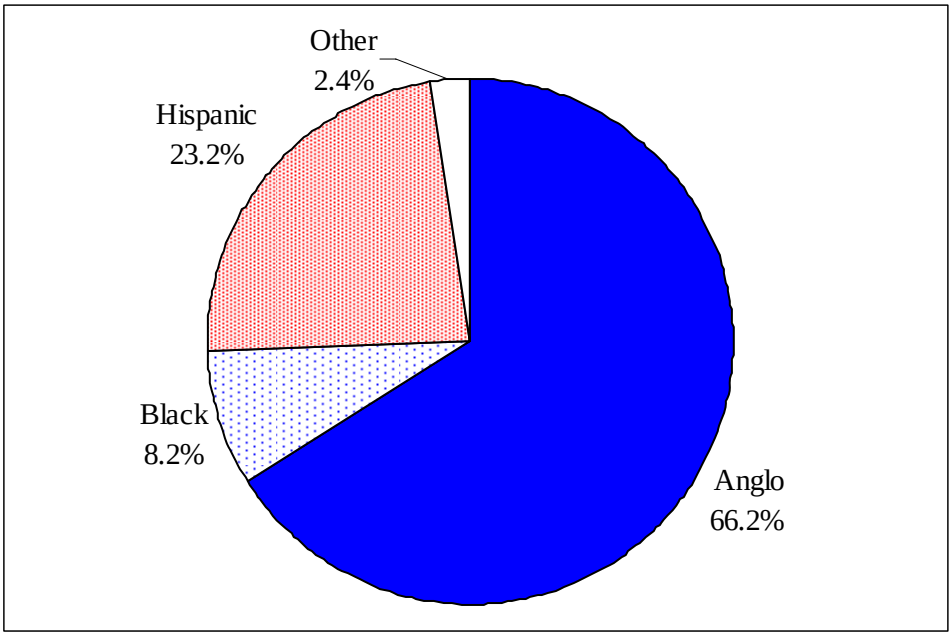

Figure 7-2: TxDOT Employee Diversity Profile (as of February 28, 2006)
Source: TxDOT, 2006

The top panel of Table 7-7 provides a detailed breakdown of the percentage of TxDOT employees by Race/Ethnicity within major job categories while the second panel shows the racial/ethnic composition of such job categories for the State as a whole and the third panel shows the extent to which TxDOT's patterns differ from those for the State. A comparison of TxDOT and Texas workforce patterns show that in 4 of 7 categories non-Anglos are less well represented in the TxDOT workforce than in the Texas workforce as a whole. Non-Anglos are more underrepresented in the administrative ranks than in any other category with the percentage of non-Anglos in such positions being more than 28 percent less than the percentage of non-Anglos in administrative positions in the State as a whole. Thus, whereas only 14.1 percent of administrative positions in TxDOT involved non-Anglos, 42.4 percent of the occupants of administrative positions in the State as a whole involved non-Anglos. To be similar to the overall distribution of the State an additional 16.5 percent of all administrative positions would need to be occupied by Hispanics, an additional 7.9 percent by African-Americans and an additional 3.8 percent by members of Other non-Anglo groups. On the other hand TxDOT shows higher percentages of non-Anglos in the professional and technical categories than is true in the State as a whole. TxDOT faces challenges in attaining even the current diversity of employment in Texas, particularly at the administrative level.

Table 7-7:
2006 Race/Ethnic Characteristics of TxDOT Workforce by Job Category Compared to Texas Labor Force (2000 Equal Employment Opportunity Data)

TxDOT Workforce, 2006					
Job Category	**Anglo**	**Black**	**Hispanic**	**Other**	**Employees**
Administrative	85.9	2.6	11.0	0.6	348
Professionals	69.0	7.2	19.3	4.4	5,032
Technicians	66.2	8.3	23.4	2.1	3,805
Protective Service Worker	70.0	20.0	-	10.0	10
Administrative Support	62.7	10.6	26.1	0.6	947
Skilled Craft	63.8	8.7	26.8	0.7	4,128
Service/Maintenance	48.8	14.2	35.8	1.2	430

State of Texas, 2000				
Job Category	**Anglo**	**Black**	**Hispanic**	**Other**
Administrative	57.6	10.5	27.5	4.4
Professionals	73.6	6.6	15.5	4.3
Technicians	71.3	8.3	13.4	7.0
Protective Service Worker	61.8	12.4	20.2	5.6
Administrative Support	56.6	15.5	26.2	1.7
Skilled Craft	59.8	11.7	24.6	3.9
Service/Maintenance	53.2	6.4	37.2	3.2

Difference				
Job Category	**Anglo**	**Black**	**Hispanic**	**Other**
Administrative	28.3	-7.9	-16.5	-3.8
Professionals	-4.6	0.6	3.8	0.1
Technicians	-5.1	0.0	10.0	-4.9
Protective Service Worker	8.2	7.6	-20.2	4.4
Administrative Support	6.1	-4.9	-0.1	-1.1
Skilled Craft	4.0	-3.0	2.2	-3.2
Service/Maintenance	-4.4	7.8	-1.4	-2.0

Source: TxDOT and U.S. Bureau of the Census Special Tabulation (EEO)

The average age of all TxDOT employees is 44.2 years. However, more telling is the fact that almost 70 percent of all TxDOT employees are older than 40 years. TxDOT, like many other U.S. DOTs, experiences challenges in retaining staff as is evident from the fact that more than half of the agency staff has 10 years or less department service. Increasing competition for employees – especially with the private sector that pays significantly higher salaries – contributes to the retention issues that TxDOT is experiencing. This is particularly problematic given the aging of the workforce. About 18.4 of all TxDOT employees have 20 years or more department service (see Figure 7-3). However, given that the average age of retiring employees was 56.7 years in FY 2005 with 23.1 years of TxDOT service, it is highly likely that most of these TxDOT employees will be eligible for retirement in the next five to ten years. In fact, Figure 7-4 shows that by 2011 fully 28 percent of the current TxDOT workforce will be eligible for retirement. As shown in Figure 7-5, the percentages eligible for retirement are particularly high in the executive ranks. Clearly the aging of the population is of particular significant for entities such as TxDOT.

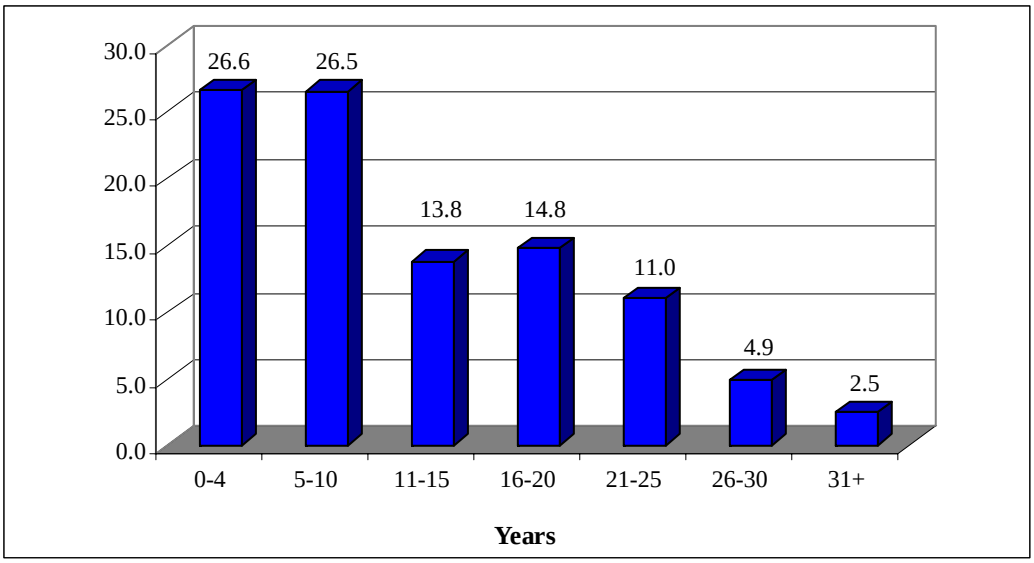

Figure 7-3: TxDOT Workforce Tenure (as of February 28, 2006)
Source: TxDOT, 2006

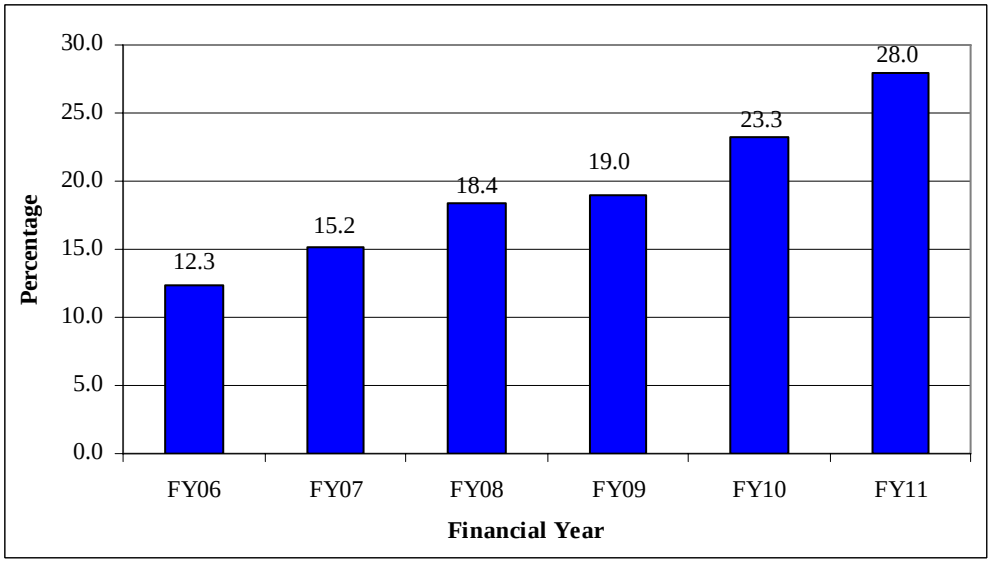

Figure 7-4: Percentage of TxDOT Employees Eligible for Retirement (2005)
Source: TxDOT, 2006

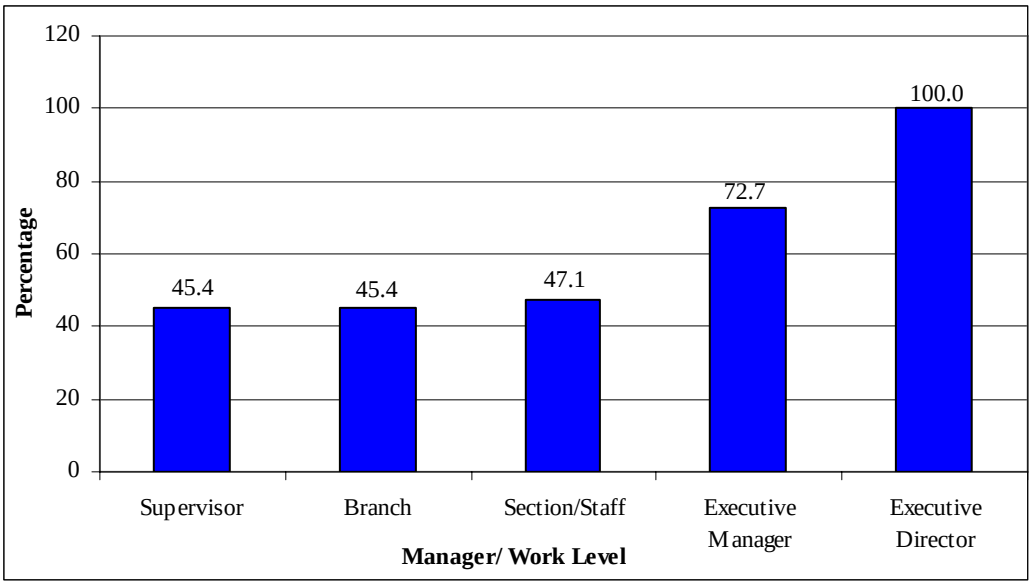

Figure 7-5: Percentage of TxDOT Management Staff Eligible to Retire by FY 2011 (2005)
Note: Since this information was compiled, the Executive Director, Mr. Behrens, has retired.
Source: TxDOT, 2006

Implications of Texas Demographics for the TxDOT Labor Force

The above descriptions point to the general types of changes that will be necessary if TxDOT is to replace its workforce with the diversity necessary to better reflect the future population of Texas. However, in this section, we further explicate the extent of such changes by providing a simple description of changes that would be necessary for TxDOT to create a workforce similar to that in the State as a whole over the projection period.

Among the most significant impacts for the workforce of TxDOT of the population growth projected to occur in Texas in the coming years is the likely need to increase the size of that workforce. Although there is a legislative cap on the size of its workforce at the present time it is likely that such caps may have to be lifted unless there are significant increases in efficiency as a result of technological, contracting or other changes. Although it is speculative to project future growth in the TxDOT workforce, the use of a few simple ratios shows how extensive such growth could be. For example, in 2006 an examination of the number of TxDOT employees compared to the estimated population of Texas (of 23,507,783) shows that there were approximately 1,600 Texans per TxDOT employee. If such ratios were to characterize the future, the size of the TxDOT workforce by 2040 would be between (depending on the assumed level of population growth, i.e. the projection scenario employed) 27,200 and 32,300 and even assuming that this ratio was increased to 2,500 persons per employee the size of the TxDOT workforce would be between 17,400 and 20,700. These represent increases from the present 14,700 workers of between 85 and 120 percent under the 1 to 1,600 ratio and of between 18 and 41 percent under the 1 employee per 2,500 persons. Although any such suggestion is highly speculative, what such values suggest is that the recruitment requirements for TxDOT may well involve the need to recruit a larger number of professionals than at present, increasing the already significant challenge presented to TxDOT.

Equally significant, given the growing percentage of women engineers and other professionals is the need to increase the recruitment of women in additional and more professional positions in TxDOT. Its current 24 percent share of women in its workforce is unacceptable both now and in the future.

Figure 7-6 and Table 7-8 show results of what is likely to be required to attain a workforce with racial/ethnic characteristics that reflect the population of Texas. The data in the figure indicate how extensive the basic changes will be in the distribution of the labor force in Texas over the projection period with the proportional shifts largely involving a steep decline in the proportion of the work force made up of Anglos with a similarly large increase in the proportion which is Hispanic. Overall, roughly 5,000 Hispanics will need to replace a similar number of Anglos. Equally substantial are the changes that would be necessary in the distribution of the TxDOT workforce. As shown in Table 7-8 to reflect even the changes expected by 2010 will require hiring an additional 1,800 Hispanics and roughly 350 additional African-Americans and 350 additional persons from Other racial/ethnic groups. Under the present employment cap this would require that nearly all Anglo retirements involve hiring non-Anglo replacements.

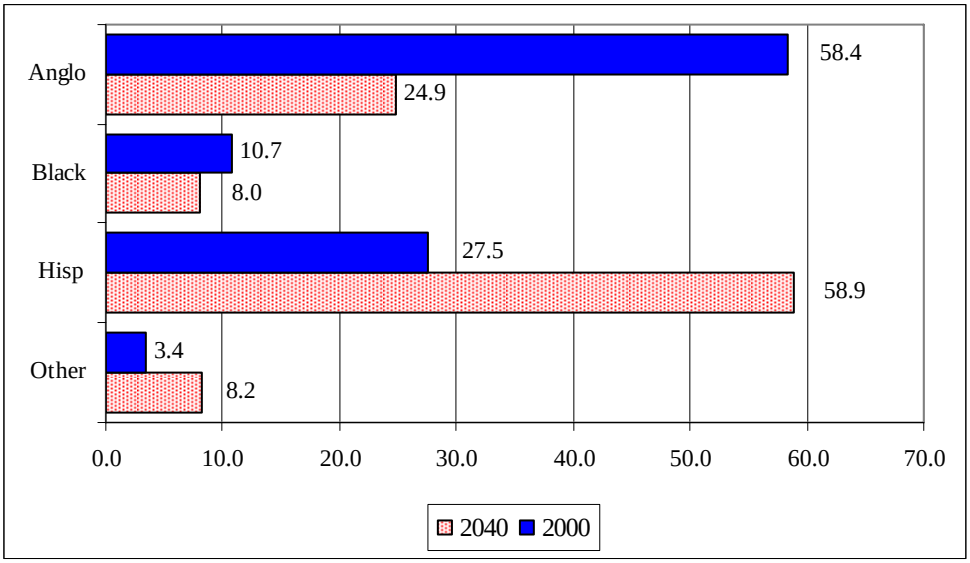

Figure 7-6: Civilian Labor Force in Texas by Race/Ethnicity in 2000 and Projections to 2040 Using Population Projection Scenario 1.0)

Human Resources Planning Needs in TxDOT

What such data suggest is that human resource planning must play an essential role in TxDOT. Caruth et al (2000) define human resources planning as a "systematic, ongoing activity that ensures that an organization has the right numbers and kinds of people in the right jobs at the right time so that the organization can achieve its stated objectives" (Caruth et al. in Hood, Alarid, and Albright, 2000). Weatherby Gilliland (2001) reported that DOT's are challenged to recruit and retain certain skilled workers, specifically in information technology (IT) and senior civil engineers. The situation is not different for TxDOT as the competition with the private sector for engineering and IT resources have resulted in TxDOT struggling to retain these skills. TxDOT has also seen an increase in the number of employees with 0 to 4 years tenure leaving the department for higher paid positions in the private sector. Figure 7-7 shows that about 48 percent of all separating TxDOT employees and 26 percent of all TxDOT employees left the department within the first 4 years of service. Furthermore, approximately 67 percent of all separating employees (and 52 percent of all employees) leaving the department had 10 or less years of service with TxDOT.

Table 7-8:
Projected TxDOT Workforce Demographics Assuming Similar Characteristics of Total Texas Labor Force

Projection Scenario 1.0				
Year	**Anglo**	**Black**	**Hispanic**	**Other**
2006	9,733	1,212	3,408	349
2010	-2,530	361	1,825	342
2020	-3,912	273	3,104	533
2030	-5,117	126	4,280	710
2040	-6,073	-36	5,250	857

Projection Scenario 00-04				
Year	**Anglo**	**Black**	**Hispanic**	**Other**
2006	9,733	1,212	3,408	349
2010	-2,530	361	1,825	342
2020	-3,868	273	3,060	533
2030	-5,029	126	4,192	710
2040	-5,926	-21	5,089	857

Source: Derived from Texas State Date Center Estimates and Projections Program; U.S. Bureau of the Census; TxDOT

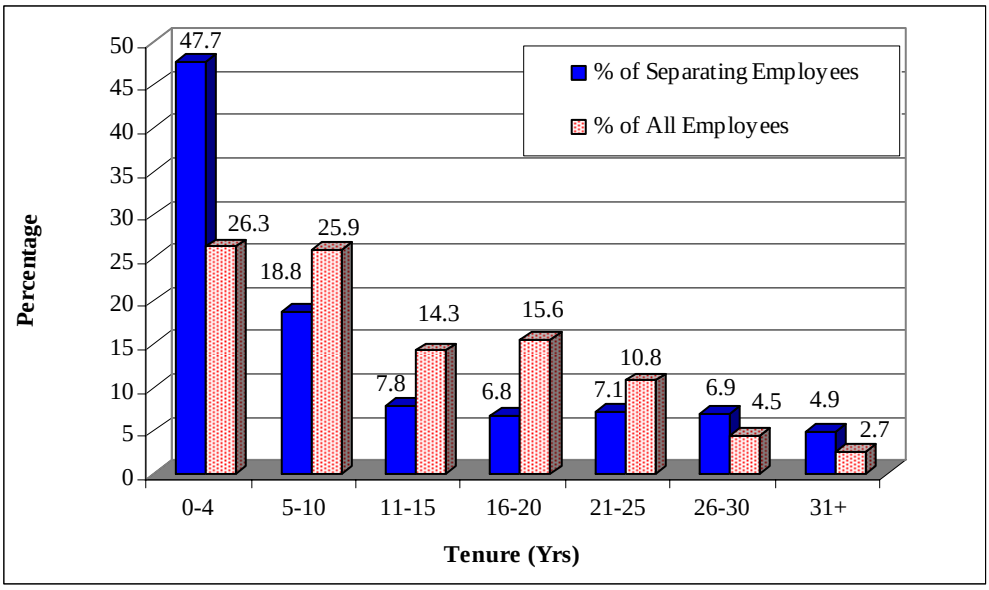

Figure 7-7: Tenure of Separating Employees Compared to Tenure of All Employees (2005)
Source: TxDOT, 2006

Given that more than 70 percent of TxDOT's workforce is older than 40 years but 20 percent of those separated in 2005 were 29 years of age or younger, human resource planning needs to examine means of retaining younger workers.

One of the reasons cited by those employees that voluntarily terminated their service with TxDOT in FY05 was inadequate salary (19 percent). The remainder stated personal reasons (41 percent), retirement (29 percent), and other (11 percent). Given that 28 percent of TxDOT's workforce will be eligible for retirement by FY11 and the increased competition for skilled workers in science and engineering together with the already relatively high turnover rate of younger staff, TxDOT may benefit from a critical review of its salary structures, especially entry level salaries, as well as its training and education programs to develop the skills of a younger and possibly less educated future workforce.

Progressive Succession Planning

TxDOT's 2007-2011 Workforce Plan recognizes that "strategic workforce planning will allow the department to proactively integrate organizational processes that avoid labor surpluses, mitigate talent shortages, and establish opportunities for competent employees to advance" and therefore calls for a "progressive succession system". Succession planning can be defined as a concerted effort to ensure a "qualified pool of employees for key positions" (Weatherby Gilliland, 2001) either through recruitment or the training of existing staff. According to Weatherby Gilliland (2001) succession planning is evident from an organization's policies and programs to cross-train staff, professional development/training opportunities offered, and the practice of individualized evaluations of staff persons and development of personalized annual professional development plans.

TxDOT has embarked on a number of programs and initiatives to address the foreseen human resources issues highlighted in the previous section, including:

- Identifying the skills and capabilities that the agency will need to recruit, retain, train, and sustain a competent workforce,
- Authorizing the Standing Committee on Training (SCOT) to develop a "comprehensive strategic training program that will address and sustain a management and technical training program",
- Embarking on a Knowledge Management initiative that aims to capture the critical business knowledge of the agency in one repository that can be shared with users, thereby facilitating the learning of employees and providing a forum for sharing best practices,
- Creating a job rotation program that is a four year internship program to allow TxDOT employees to be cross-trained,
- Working with Texas Pre-freshman Engineering Programs (TexPREP) to encourage middle and high school students to pursue transportation careers,
- Pursuing an accelerated hiring process
- Creating high school/college summer employment opportunities,
- Developing Career development programs
- Increasing temporary recruitment programs
- Improving executive training,
- Providing tuition assistance
- Creating award and recognition programs
- Offering recruitment and retention bonuses (TxDOT, 2006)

These are excellent programs and initiatives. However, in addition, a critical review of TxDOT's salary structure may be necessary to attract and retain a competent future work force.

Conclusion

Texas demographic future will largely determine the demographic characteristics of its future labor force including the characteristics of those workers available to TxDOT. Although TxDOT's challenges are similar to those in many public agencies in Texas and elsewhere, they are made particularly difficult by the number of professional engineering and other technical skills required of many TxDOT workers.

TxDOT will be challenged in a number of ways. First, it may have to recruit a larger workforce of increasingly skilled professionals at a time when the number of new graduating engineers and other skilled professionals is either growing slowly or (under some estimates) even declining. Second, it will need to substantially increase the number of women and non-Anglos in the TXDOT workforce substantially from a pool of women and non-Anglo engineering and other graduates that although increasing is not growing rapidly enough to dramatically change the proportions of women and non-Anglos in the ranks of professionals available for employment. Finally, although many of the projections provided here examine a 40 year time frame, the age structure of the current TxDOT workforce (with 70 percent of its workers being 40 years of age or older) means that many of these goals will likely require actuation within only 10 to 15 years.

The good news is that these are all trends of which TxDOT is aware and has ongoing programs to address. What the demographic and related data in this chapter demonstrate is that such programs are not only necessary but are likely to be challenged in meeting their goals at least as much as anticipated in the coming years.

Chapter 8

Summary, Conclusions and Implications

In this volume we have examined some of the implications of population change for transportation issues in Texas and for TxDOT as an organization. These are not all of the issues that may impact transportation or TxDOT in the coming years. There are numerous other important issues that could not be addressed due to data limitations and other factors. It is also evident that the implications that have been drawn in this volume were derived primarily from applying assumptions related to transportation related factors to projections of population. Both the assumptions related to the transportation factors and those related to the population projections may not be correct and, as a result, the projections provided here of population and related transportation factors may not be correct. It is essential for all those utilizing this volume to be aware of its limitations.

In this final chapter we first summarize the major substantive findings from the analysis and then attempt to broaden the discussion to implications and conclusions that appear to follow from the demographic and demographic-transportation relationships noted previously in this volume. The intent is to give the reader a better understanding of the broader range of implications that demographic change has for transportation and related factors.

Summary

Among the major findings in this volume are the following:

Relative to General Patterns of Population Growth and Distribution

1. Texas historical population growth has been extensive and the growth in TxDOT districts has reflected that growth. The districts of Austin, Pharr, Dallas, Fort Worth, Laredo, Houston, and San Antonio have shown the most rapid increases over the past 25 years in concert with the overall growth in the Houston, Dallas-Ft. Worth, Austin-San Antonio, and Laredo to Brownsville Corridors. Whereas none of the 25 TxDOT districts had as much as 10 percent of the State's population in 1920, by 2006, the five largest districts of Austin, Dallas, Fort Worth, Houston, and San Antonio had 64.4 percent of the State's total population (they had only 34.4 percent of the State's population in 1920).
2. In general, the geographical distribution of historical population growth has followed a relatively consistent pattern for many decades. Suburban counties have shown the most rapid growth (e.g., 40.8 percent, 45.0 percent and 27.4 percent during the 1980s, 1990s, and 2000 to 2006 periods respectively) followed by central city (19.4, 20.5 and 10.9 percent), nonmetropolitan adjacent (to metropolitan) counties (6.6, 13.8 and 4.5 percent), and nonmetropolitan nonadjacent counties (1.6, 7.9, and 1.7 percent). As a result, suburban areas have come to account for an increasing proportion of the State's population with all metropolitan counties (both central city and suburban) accounting for 86 percent of the State's population by 2006 (up from 81 percent in 1980).
3. The two most likely population projections from the Texas State Data Center suggest that Texas population will increase to between 43.6 million (under the 00-04 scenario) and 51.7 million (under the 1.0 scenario), increases of 109 and 148 percent respectively from 2000 to 2040. The major difference between these two scenarios is that the scenario based on the most recent (2000 to 2004) period shows more counties, including metropolitan and rural counties, losing population.

4. Under the 1.0 scenario all but two TxDOT districts (these being the Abilene and Childress districts which lose between 4,300 and 4,400 each) add population between 2000 and 2040 with the fastest growing being the Dallas (increasing by 268.3 percent from 2000 to 2040), Austin (267.1 percent), Houston (173.7 percent), Pharr (also 173.7 percent) and Fort Worth (162.1 percent) districts. Under this scenario, the Dallas district gains nearly 9.2 million, Houston more than 7.9 million, Austin more than 3.6 million, Fort Worth nearly 3.0 million, Pharr more than 1.7 million, and San Antonio nearly 1.4 million between 2000 and 2040. As a result, both the Dallas and Houston districts will have more than 12 million people, Austin nearly 5 million, Fort Worth nearly 4.8 million, San Antonio nearly 3.2 million, Pharr more than 2.7 million, and each of the districts of El Paso, Tyler, and Waco more than 1.0 million people by 2040.

5. Under the 2000-2004 scenario, six districts (Corpus Christi, Lubbock, Abilene, Wichita Falls, San Angelo, and Childress) lose population while the fastest growing districts are Dallas (207 percent from 2000 to 2040), Austin (171.6 percent), Fort Worth (171.1 percent), Houston (136.6 percent), and Pharr (134.8 percent). Under this scenario both Dallas (at nearly 10.5 million) and Houston (at more than 10.8 million) have more than 10.0 million people by 2040, Fort Worth has nearly 5.0 million (and is the major area in which the 2000 to 2004 scenario produces a higher projection than the 1.0 scenario), Austin 3.6 million, San Antonio 2.8 million, and Pharr nearly 2.4 million. No other areas have more than a million people, although Tyler has more than 956,000 and El Paso nearly 931,000. The largest increases from 2000 to 2040 are 7.1 million in the Dallas district, followed by Houston at 6.2 million, Fort Worth at 3.1 million, Austin at 2.3 million, Pharr at 1.4 million, and San Antonio at more than 1.0 million. The largest loses are in Wichita Falls with a projected loss of roughly 32,000, San Angelo with a loss of roughly 25,000 and Lubbock with a loss of nearly 11,000 by 2040.

6. As a result of such changes, the proportion of the population of Texas in metropolitan central city counties decreases to as little as 55.4 percent (under the 00-04 scenario) from 67.1 percent in 2000 while the proportion in suburban counties increases to 36.0 percent in 2040 from 17.7 percent in 2000. The proportion in nonmetropolitan counties decreases from 10.7 in 2000 to as little as 6.3 percent, and nonmetropolitan nonadjacent counties decreases to 2.3 percent by 2040 from 4.4 percent in 2000. The relative dominance of metropolitan, particularly suburban, growth is evident. Of the total net change of 30.9 million under the 1.0 scenario, 95.3 percent occurs in metropolitan areas while for the 22.7 million projected to occur under the 00-04 scenario, 97.5 percent occurs in metropolitan areas. The largest difference in the two scenarios occurs relative to suburban and central city counties. Under the 1.0 scenario, 54.9 percent of the net change is accounted for by central city counties and 40.4 percent by suburban counties while under the 00-04 scenario, 44.7 percent is accounted for by central city counties and 52.8 percent by suburban counties. Under either scenario, there is further metropolitan concentration of the population, with relative increases in the suburban proportion but the suburbanization of the population is accentuated under the 00-04 scenario.

7. Such changes are likely to have substantial impacts on TxDOT. The magnitude of growth projected will substantially increase transportation demand especially in suburban areas of the State where growth is already challenging the transportation infrastructure. In rural areas, more stagnant patterns of growth, and in some cases decline, are likely to lead to challenges in maintaining roadway systems with reduced populations, and related resources. In all areas of the State, population change will challenge transportation resources.

Relative to Changing Population and Household Characteristics

The characteristics of a population impact services both directly and indirectly. The direct impacts include such affects as those that age has on the need for health and related services or that a population with a large number of children has on educational services. Similarly, an older population may create increased demand for transportation services for the disabled and create an increased risk of accidents related to advanced age. The effects may also be indirect. Among such indirect effects of demographic characteristics are those related to socioeconomic resources. In particular, income tends to be highest in households with middle-aged householders and lower in households with younger and older householders. Due to a variety of historical, discriminatory, and other factors incomes tend to be higher for households with an Anglo or Asian householder than for those with an African-American or Hispanic householder. Similarly, dual adult married-couple households tend to have higher incomes than single-adult households. As a result, the changing characteristics of a population change its level of demand on services, including transportation, and may affect the ability to pay for such services. What are the major changes projected to occur in the characteristics of the Texas Population?

8. Texas was roughly two-thirds Anglo in 1980 but, by 2004, it had become less than one-half Anglo and is projected to become more than 50 percent Hispanic sometime between 2025 and 2035. By 2040, Texas population is projected to be between 24 and 25 percent Anglo, about 8 percent African-American, 58-59 percent Hispanic, and about 9 percent will be members of Other racial/ethnic groups. TxDOT districts will vary in how rapidly they diversify but the percent of the total population that is Anglo will decrease in every district under each of the two scenarios. By 2040 there will be only 4 districts (Brownwood, Childress, Paris, and Wichita Falls) that have more than 50 percent Anglos (under either scenario) compared to 18 in 2000.

9. The population of Texas, like that in the rest of the nation, is aging in an aggregate sense. However, there are marked differences in the age structure of the population in different racial and ethnic groups with the median age of Anglos being roughly 10 years older in 2000 than that for Hispanics. With Texas relatively high percentage of non-Anglo population it is a relatively young state with the third lowest median age of any state in the nation in 2000. Despite this relative difference, the Texas population will age. From 2000 to 2040 the median age of the State's population is projected to increase from roughly 32 years in 2000 to between 38 and 39 years of age by 2040. Median ages vary by TxDOT district (largely reflecting the racial/ethnic structure of its population) from less than 28 in the Laredo and Pharr districts to more than 40 years in the Childress district in 2040 but in every district under both scenarios the median age will increase over the projection period. What is particularly noteworthy is that the population 65 years of age and older will increase markedly compared to the population as a whole from 9.9 percent of the total population in 2000 to about 16 percent of the population by 2040. Whereas the total population will increase from between 109 to 148 percent, the population 65 years of old will increase from about 2.2 million in 2005 to between 7.1 and 8.2 million in 2040, entailing a percentage increase of between 220 and 273 percent from 2005 to 2040. In sum, although Texas' large non-Anglo population is projected to keep the State younger than in many other states, Texas population will age substantially.

10. In general, recent trends in households have shown their numbers to be growing faster than the total number of people until the 1990s, to be decreasing in size and to be showing larger percentage increases in non-family than in family households with the largest increases of all in single-adult family households. The extensive growth of the Hispanic population which has larger households and households that are more likely to

be made up of married-couples is projected to largely reverse the pattern of the 1990s that witnessed slower household than population growth, to curtail the decline in average household size and lead to an increase in family and married-couple households. At the same time, because of the differences in the distribution of households by race/ethnicity across income categories, the socioeconomic affect of the projected household change is to increase the number of low income and decrease the number of high income households. Household change in Texas will likely have both direct effects on factors such as transportation because family households tend to use fewer services per person than non-family households and indirectly because non-family households tend to have lower levels of socioeconomic resources.

11. Overall, the projected change in the race/ethnicity, age, and household characteristics of the Texas population may impact transportation because non-Anglos are less likely to own vehicles and drive fewer miles than Anglos; because slower growth is projected to occur in younger than older populations resulting in potential changes in off-peak travel volumes and increased demand for medical and public transportation; and because the larger household size of non-Anglo households will decrease the higher rate of growth in the number of households which might otherwise occur while reducing per-household resources to pay for transportation and other services.

Relative to Specific Dimensions of Transportation Demand and Use

The demographic trends summarized above are also examined in this volume relative to specific dimensions of transportation. Those examined include impacts on the commuting patterns of workers in Texas, effects on the number of drivers and driver-related crashes, the effects on vehicle ownership and transportation expenditures, the implications for public transportation, and the implications for TxDOT's own workforce recruitment and other employment-related activities. These are only some of the factors that might be examined and no claim of inclusiveness is asserted. Rather, we simply assert that those examined are ones likely to have significant impacts on transportation in Texas in the coming years and hence are worthy of examination here.

Among the key findings related to these factors are the following:

12. The number, percentage and characteristics of the driving population will be substantially impacted by population change. During the period from 1950 through 1990 the number of drivers increased faster than the total population increasing from roughly 2.8 million in 1950 to 11.1 million in 1990, a percentage increase of 298.2 percent compared to a 120.3 percent increase in the population. By 1990 there were 655.6 drivers per 1,000 population. This was largely a result of the large baby-boom population coming into driving ages at unprecedented rates. Then in the 1990 and the early post-2000 period the rate of increase in the number of drivers increased less rapidly than the number of people reflecting the fact that a larger percentage of the population growth was composed of persons with lower rates of driving (i.e., Hispanics and other non-Anglo groups).

13. Although the lack of data on drivers by all three characteristics of age, sex, and race/ethnicity simultaneously does not allow us to examine the combined effects of these factors, projections show that under both of the projection scenarios the number of drivers is projected to increase rapidly and the number of drivers to increase substantially. Between 2000 and 2040, the number of drivers will increase by 22.2 million (165.2 percent) under the high (1.0) scenario and by 16.8 million (124.9 percent) under the slower (00-04) growth scenario, rates of growth expected to exceed the 148 and 109 percent growth projected for the population. This will result in an unprecedented incidence of drivers per population of 690.4 drivers per 1,000 population in 2040. The increases among the oldest drivers will be particularly pronounced with the number of

drivers 65 years of age or older increasing from 1.8 million in 2005 to between 5.7 and 6.6 million (depending on the scenario) between 2005 and 2040 (increases of 218 and nearly 268 percent respectively) and changing the percentage of all drivers who would be 65 years of age or older from 12.3 percent of all drivers in 2005 to between 18.6 and 18.9 percent of all drivers by 2040. The increase among the oldest of the elderly are projected to be even more dramatic with the 141,076 drivers 85 years of age or older in 2005 increasing to between 518,000 and nearly 594,000 drivers by 2040 (a percentage increase of between 267 and 321 percent from 2005 to 2040). The characteristics of drivers will also diversify from 45 percent non-Anglo in 2005 to between 72 and 73 percent non-Anglo by 2040 with between 55 and 56 percent of all drivers being Hispanic. As for the population, the proportion of all drivers who will be Hispanic will be especially high at younger ages with the percent Hispanic exceeding 66 percent among drivers less than 35 years of age, 63 percent for drivers 35-44, and over 50 percent among drivers 45-64 years of age but only 33 percent among drivers over 65 years of age. Population growth will lead to a larger number of drivers using Texas roads and to an aging and increasingly diverse population of drivers.

14. The number of commuters in Texas increased by nearly 1.6 million from 1990 to 2000, a percentage increase of 20.4 percent (the population increased by 22.8 percent). As of 2000, 85.8 percent of all commuters in Texas lived in metropolitan central city and suburban counties, a slightly higher percentage than in 1990. Overall, 78.6 percent of all commuters worked in the county in which they resided but that varied from 88.5 percent for those living in large central city counties to 46.5 percent for persons who lived in suburban counties of large metropolitan centers and 45.5 percent for those living in suburban counties of small metropolitan areas. Although most of these suburban commuters commute to central city counties, the largest numerical change in the 1990s was the increase in the number commuting from one suburban county to another which increased by nearly 250,000 persons during the 1990s, followed by an increase of 108,000 commuters from central city counties to suburban counties.

15. From 2000 to 2040, the number of commuters in Texas will increase substantially from 9.2 million in 2000 to between 18.7 and 22.2 million (percentage increases of between 104 and 142 percent) by 2040 and the proportion living and working in the same county will decrease from 78 to 70 percent. Although central city counties will continue to have the largest number of commuters in the future under either projection, under both projection scenarios the largest numeric and percentage changes will be in the number of commuters from large suburban county resident areas. By 2040 (under either projection scenario), at least 3l percent of all commuters (compared to less than 17 percent in 2000) will reside in suburban counties, an increase of nearly 5.5 million and 350 percent from 2000 to 2040. What is most different in the two projections is the projected growth in large central city counties. Under the patterns of the post-2000 period as reflected in the 00-04 scenario, the total growth in the number of commuters is roughly 3.4 million less than under the 1.0 scenario with more than 2.9 million of the difference being a decline in the number of commuters residing in central city counties and the remainder in decreases in the number of nonmetropolitan commuters. This reflects the fact that the post-2000 period has witnessed faster suburban than central city and rural growth. Because of the rapid growth in suburban counties, commuter flows involving suburban counties show the largest increases. The number of commuters projected to commute from suburban resident areas to central city counties for work will increase by more than 2.5 million (more than 360 percent) under either scenario and the number from suburban to suburban areas will increase by more than 213,000 (by more than 340 percent) under either scenario. Population growth will lead to substantial increases in the number of

commuters and increased commuting will impact transportation infrastructure with suburban commutes playing an increasing important role in such commuting flows.

16. Demographic change will affect the total number of miles driven in personal occupancy vehicles. A larger proportion of people in the driving ages will mean that there will be more vehicle miles of travel (VMT) in the aggregate. Demographic change will mean that VMT will increase from 184 billion in 2005 to between an estimated 329 and 456 billion VMT by 2040, and increase of between 79 and 148 percent. Because drivers age 65 and older tend to drive fewer miles, increases in the proportion of drivers in these age groups will decrease daily VMT per driver slightly. In addition, changes in the race/ethnicity of licensed drivers will lessen the overall percentage growth in aggregate miles of VMT.

17. The number of crashes will also be affected by demographic change. Because the rate of crashes decreases with age, the projected aging of the population will lead to lower crash rates but to substantial increases in the number of crashes among particular age groups. The number of drivers involved in crashes will increase from between 91 to 127 percent from 2005 to 2040, less than the 107 to 144 percent increase in the number of drivers but the percentage increase in the number of drivers 65 years of age and older involved in fatality crashes will increase by between 231 percent and 284 percent (compared to rates of growth in the number of such drivers of between 218 and 268 percent). As with the impacts on the number of drivers, the effects on the number of crashes and the characteristics of those involved will reflect the realities created by demographic change in Texas.

18. Transportation expenditures will also be impacted by demographic change. As noted in Chapters 1 and 2, due to a variety of historical, discriminatory and other factors there are marked differences in the financial resources available to persons in different age and racial/ethnic groups. Income tends to be highest in the middle ages of life and lower at both younger and older ages and the incomes of Black and Hispanic households in Texas are about two-thirds of the median incomes for Anglos. What are the impacts of these differences if they continue as the population becomes older and more diverse? The analysis in this volume uses data on household expenditures by the age, sex, and racial/ethnic background of householders from the Consumer Expenditure Survey to examine such issues. Future household expenditures are projected to increase under both projection scenarios of household change relative to total and transportation related items and for expenditure for separate transportation items including new and used car purchases, gasoline and other fuel expenditures, other personal vehicle expenditures, and public transportation. Because these projections are made using national levels of household expenditures by the age, sex and race/ethnicity status of householders, they should be seen as predictive of the direction of change in expenditures in Texas but not of exact levels of expenditures.

19. The results of the analysis of expenditures indicates that unless changes occur which alter the income and related expenditures of the most rapidly growing segments of Texas population--older and more diverse population groups--the net effect of population change will be to reduce the per household rates of expenditures on transportation in Texas compared to those in 2000. According to these projections, although transportation expenditures will increase more rapidly than total household expenditures, increasing by between 114 and 151 percent from 2000 to 2040 (from less than $56 billion in 2000 to between $119 to $140 billion by 2040 under the 00-04 and 1.0 scenarios respectively) compared to 108 to 144 percent increases in total household expenditures

(from about $274 billion in 2000 to between $570 and nearly $670 billion by 2040), the increases in transportation expenditures (in 2000 constant dollars) will be less than the projected increases in the number of households of between 128 and 167 percent. Thus transportation expenditures per household will decline from roughly $7,600 per household in 2000 to approximately $7,100 in 2040 (in 2000 constant dollars), a decline of $500 dollars, or 7-8 percent in real dollar terms. In fact, the effects of the changing composition of the Texas population were examined in detail by assuming the same number of households as projected in 2040 under the two projections of households but comparing the projected changes with the expected patterns of change in age, sex, and race/ethnicity to the changes that would be expected with the age, sex, and race/ethnicity characteristics of the Texas population as it existed in 2000. This comparison suggests that the composition of Texas population in 2040 will decrease transportation expenditures by about $12 billion (between 8.5 and 9.7 percent depending on the scenario) compared to what it would be if there had been the same number of households as projected but no change in characteristics. When examined by type of transportation expenditure, it is evident that the largest projected increases in expenditures under the projected population structure of Texas is projected to occur in public transportation which increases between 125 and 163 percent from 2000 to 2040 compared to the 114 to 151 percent increases in total transportation expenditures. In sum, except for expenditures for public transportation, the projected population change will likely reduce expenditures on transportation in Texas at the same time that increased demand may increase transportation costs.

20. Vehicle ownership and the use of public transportation will also be impacted by demographic change in Texas. Roughly 93 percent of all households had one or more vehicles available to the household in 2000 but the availability varies by age and race/ethnicity. Only 6 percent of households with a householder 15 to 64 years of age did not have a vehicle available to the household, 14 percent of households with a householder who is 65 years of age or older had no vehicle available. Whereas in 2000 only 6 percent of all households with a householder 15 to 64 did not have a vehicle available to the household, that percentage varied from 3.1 percent of Anglo households with a householder 16 to 64 years of age to 13.9 percent of households with a Black Householder and 8.8 percent of Hispanic householders and 5.6 percent of households with a householder who was 16 to 64 years of age and from an Other racial/ethnic group. Similarly the percentage of households without a vehicle available among households with a householder who was 65 years of age or older varies from 9.7 percent for Anglo households to 28.0 percent for African-American and 25.8 percent of Hispanic households with an elderly householder. Given the aging and diversification of the population what may be the affects on vehicle ownership and the demand for public transportation? If such trends continue, by 2040 there will between 1.2 and 2.0 million households without vehicles compared to 544,585 in 2000, an increase of between 218 and 272 percent. This is substantially higher than the overall increase in the number of households of between 128 and 167 percent. This will reduce the demand on public road infrastructure but increase demand on public transportation. By 2040, 10.3 percent of households compared to 7.4 percent in 2000 will have no vehicle available. Due to differential rates of access to vehicles by race/ethnicity, although all racial/ethnic groups will see increases in the number of zero vehicle households, the majority of new zero vehicle households will be headed by non-Anglos with over 60 percent headed by Hispanic householders. Demographic change will increase the number of persons who will be dependent on public transportation.

21. The aging of the population coupled with higher rates of disability among some non-Anglo populations will lead to increased levels of demand for specialized transportation from persons with various forms of disability. Projections of the number of disabled persons suggest that such demand will exceed the rate of growth of population as a whole with the number of individuals with out-of-home disabilities who are 16 to 64 years of age increasing by between 141 and 182 percent from 2000 to 2040 while the number of elderly with disabilities increasing by between 277 and 334 percent. By comparison, the population will increase by between 109 and 148 percent from 2000 to 2040. The number of households without vehicles will increase dependence on public transportation and increases in the number of disabled persons will increase the demand for specialized forms of public transportation.

22. As a result of demographic change, the total number of public transit riders on the journey-to-work could increase from 162 per 1,000 in 2000 to between 417 and 497 riders per 1,000 in 2040, by between 156.7 and 206.4 percent. Texas future demographics are likely to increase the demand for public transit in Texas.

23. Texas future labor force will be larger and increasingly diverse. By 2040, the labor force will be between 20.1 and 23.8 million up from 9.8 million in 2000. In percentage terms this increase is between 104 and 142 percent, less than that for the total population of 109 and 148 percent but substantial growth. By 2040, the labor force will be approximately 25 percent Anglo, 8 percent African-American, 59 percent Hispanic, and 8 percent will be members of other racial/ethnic groups compared to about 58 percent Anglo, 11 percent African-American, 28 percent Hispanic, and 3 percent from Other race/ethnicity groups in 2000. When the number of graduates in engineering in Texas is examined for the period from 1995 to 2005 it is clear that although this pool is also diversifying both in terms of gender and racial/ethnic (with percentage increases of women and non-Anglo graduates being larger than those for Anglos), graduates were still 78 percent male and 61 percent Anglo in 2005.

24. As of February of 2006, TxDOT's workforce was composed of 14,700 people 24 percent of whom were women employed primarily in support positions. One-third were non-Anglo but with the percent non-Anglo being only 13.9 percent in the administrative category. The average age of TxDOT employees was 44.2 years and 70 percent of the entire workforce was 40 years of age or older. As a result, 28 percent of all TxDOT employees are estimated to be eligible to retire by 2011.

25. Although technological, contracting and other factors may lead to less sharp increases in the number of TxDOT employees in the future, if the number of TxDOT workers continues to track population change, TxDOT could need between 17,400 workers under a projection of slower population growth (the 00-04 scenario) and increased efficiency relative to population and 32,000 assuming the same ratios of TxDOT employees to population as in 2006 and a higher level of projected population growth (1.0 scenario). Although this is a wide range, it is likely that TxDOT workforce will show at least some increases and will have extensive replacement due to retirement. If TxDOT wishes to have a workforce that reflects the population of Texas, extensive efforts will be needed to recruit more women and non-Anglo professionals at all job levels. For example, to reflect the State's racial/ethnic categories by 2040 even with the current legislatively capped size of 14,700, TxDOT would need to replace approximately 5,000 Anglos with an equal number of Hispanics. TxDOT has implemented an extensive program to meet these needs but it is clear that the agency will face extensive challenges in both meeting its technical requirements and in attaining a workforce that better reflects the Texas population.

Conclusions and Implications

In addition to the specific results summarized above the overall findings suggest several broad conclusions with extensive implications. It is these conclusions and implications that are examined here. In presenting these broad conclusions and implications, the authors recognize that a large number of economic, social, political, and other factors may alter them and that their perspective is limited by their experience and academic bases. In particular, the authors are primarily demographers and do not have the technical base of knowledge regarding transportation infrastructure possessed by many TxDOT professionals. In sum, these conclusions should be examined with full realization of the limitations of the authors. We present these as major challenges likely to impact Texas and TxDOT.

The Challenge of Growth

Although it is obvious, as we examine the implications of other dimensions of demographic change, we tend not to pause sufficiently to recognize the significance of population growth in Texas. Texas past and projected future population growth is simply extraordinary but not unprecedented. Texas population roughly doubled in the 40 years from 1930 to 1970, a period which included the great depression and both WWII and the Korean War, and doubled again in the 35 years from 1970 to 2005. As a result, the slower of the two levels of projected growth which more than doubles the population of the State to nearly 44 million by 2040 would not be an unprecedented level of growth relative to Texas historical patterns. At the same time, it would entail adding another nearly 23 million people to Texas population. The 1.0 scenario would increase the population by roughly 1.5 times the population in 2000 and add nearly 31 million new persons to Texas 2000 population, and this growth, although extensive, is possible given Texas recent demographic history.

Such magnitudes of growth simply stress, and in some cases over stress governmental structures. Although a level of growth in transportation infrastructure equal to the rate of projected population growth is neither likely, nor perhaps even possible, a level of transportation infrastructure development equal to doubling present capacity would represent a phenomenal effort. Technological and other developments will alter the level of demand and the resources necessary to address them but it is essential to begin any examination of what population change means for transportation by simply recognizing the sheer magnitude of the changes needed to simply meet population-growth related demands.

What is equally important relative to this challenge is that of recognizing that meeting the transportation challenges may well be the key to the achievement of the levels of growth projected for Texas. Population projections like those made in other areas are made under the assumption that everything else (including economic development) will occur as it has in the past. If transportation infrastructure cannot be provided as needed the transportation system could, together with other factors, lead to a slowdown in Texas economic and demographic growth. It is essential then to realize that meeting the transportation challenge resulting from population growth may well be essential to the demographic and economic development of Texas.

The Challenge of Population Distribution

The challenge of where population growth is occurring is also significant. Growth is moving increasingly to suburban areas while at the same time, nonmetropolitan areas are, in many cases, struggling to maintain their populations. Among the challenges created by these patterns of population distribution is that of providing levels of services in rural areas sufficient to maintain the transportation infrastructure while at the same time meeting the demands for new infrastructure in the most rapidly growing areas of Texas.

Among the other challenges to TxDOT may be that of evaluating whether its organizational and geographic bases of service delivery require a re-evaluation given the realities created by past patterns of growth and those likely to characterize the future and considerations of the challenge of actuating any changes that are identified as necessary.

The Challenge of an Aging Population

The aging of the Texas population presents its own set of challenges. As noted in this and previous chapters the increase in the number of elderly will substantially increase the number of older drivers and with that increase the number of crashes and the number of people requiring specialized transportation for those with disabilities. However, there is yet other challenges created by an aging population that is more likely to be on fixed incomes and hesitant to increase their level of household expenditures. In those areas where high proportions of the elderly live, or move into to live, the ability to raise additional resources for transportation (and other) services may be more difficult. Maintaining a mix of services that ensures the support of the elderly population may be increasingly important in the coming years.

The Challenges of Increased Diversity

Many of the factors impacted by diversity have been identified in this volume but others are more difficult to quantify but require some discussion. Among these are the need to not only recognize but to incorporate more inclusive cultural, linguistic, and social practices in TxDOT's and other organization's corporate cultures. This is not an evaluation of existing patterns in TxDOT, because no such evaluation has been completed, but rather a recognition that changes in racial/ethnic composition of the magnitude identified above will likely require corporate change in both public as well as private-sector entities throughout Texas.

The challenges of diversity also include elements beyond the control of TxDOT but are clearly extensive challenges for all of Texas. Public and private-sector organizations in Texas with large technical components in their workforce activities need access to well educated non-Anglo populations. Texas is presently producing an insufficient supply of such workers in part because dropout levels and other factors remain very high. This is a very extensive challenge because of the magnitude and the current differentials in education. For example, in Texas in 2000, whereas 30 percent of adult Anglos had a college degree, only 15.3 percent of African-Americans and 8.9 percent of Hispanics had such degrees. Unless the State is able to increase the number of non-Anglo engineering and other graduates substantially it will be difficult for agencies such as TxDOT to reach their diversity goals.

Even more important, unless the most rapidly growing segments of the population obtain the educational levels necessary to compete effectively in the increasingly international labor force, Texas is likely to become poorer and less competitive (Murdock et al. 2003). The historical, discriminatory and other factors that have led to such educational and related socioeconomic differences must not be allowed to limit the production of an educated workforce that can create a competitive and more prosperous Texas.

The challenges created if Texas fails to educate and create a competitive workforce are extensive for transportation and other services as well. One of the most basic challenges is that the increased demand for services created by the growth in the size of the population may not be matched by a commensurate increase in the resources to pay for such services. This was noted above in relationship to household expenditures on transportation but its ramifications are extensive.

The lack of sufficient financial resources to pay for service demands may lead to continuing budget short falls and to a need to search for alternative forms of funding for transportation infrastructure. At the same time, the lack of resources in large segments of the population may create resistance to solutions that require larger household expenditures coupled with resistance to the provision by a public agency of different levels of services to different segments of the public, no matter how they are financed.

The Challenge of An Aging and Diverse Population

There are also potential impacts likely to result from the concurrence of both aging and diversity at the level projected for the Texas population. Texas projected growth is likely to produce an older population that is largely Anglo coupled with a younger population that is largely non-Anglo, particularly Hispanic. This composition seems likely to accentuate support for some types of transportation services, lead to conflicts in regard to others, and to lead to patterns that interactively limit yet other transportation services.

As noted above, the fact that non-Anglo populations are more likely to live in zero vehicle households and the elderly to be somewhat less likely to drive and to have increasing numbers who will need specialized transportation may lead to an increase in political support by both groups for public transportation. A coalition based on need may lead to areas of cooperation between these groups that overcome racial/ethnic and age differences and accentuate the support for public transportation.

For a second set of services, the fact that non-Anglos are likely to be younger and needing more transportation services related to work and family activities that require additional transportation expenditures while the Anglo elderly are at life stages that make them hesitant to increase expenditures and less likely to use such services may lead to opposition between these groups in areas where there are few perceived direct benefits for the elderly. In such circumstances the confluence of age and race/ethnicity differences may lead to conflicting perspectives.

On yet a third set of factors, the aging Anglo and younger non-Anglo populations may come to act concurrently to limit services. Such might be the case in service areas that are largely used by middle-aged and middle class Anglo constituencies. Although this set of individuals may well have the resources to directly pay for the services they wish to obtain, the financial constraints of the budgets of many elderly and non-Anglo households may make both population segments hesitate to support services that are not directly beneficial to them and that they see as deflecting a public agency from activities that promote more generalized public services.

Final Observations

Many of the potential affects noted in this final section of this chapter are highly speculative but they and the other demographic effects examined in this volume clearly point to the need to have a basic understanding of the demographics of any service or area impacting human populations and of the services and products used by them. Demography is not destiny but it is important in understanding what is occurring and why it may be occurring and what may occur in the future. While making no claim to inclusiveness, we hope that this volume has helped to establish the utility of examining the demographic dimensions of a service, a development or policy or program just as one would its fiscal and economic dimensions.

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Appendix 2:

Counties by County Classifications Used in Report

Metro Central City	Metro Suburban	Non-Metro Adjacent			Non-Metro Non-Adjacent	
Bell	Archer	Anderson	Hill	Runnels	Angelina	Loving
Bexar	Bastrop	Andrews	Hockley	Rusk	Bailey	Mason
Bowie	Brazoria	Aransas	Hopkins	San Jacinto	Borden	McCulloch
Brazos	Caldwell	Armstrong	Hudspeth	Schleicher	Brewster	Mills
Cameron	Chambers	Atascosa	Hutchinson	Shackelford	Briscoe	Mitchell
Dallas	Collin	Austin	Irion	Somervell	Brown	Montague
Ector	Comal	Bandera	Jack	Starr	Childress	Motley
El Paso	Coryell	Baylor	Jackson	Sterling	Cochran	Nacogdoches
Galveston	Denton	Bee	Jasper	Swisher	Collingsworth	Ochiltree
Grayson	Ellis	Blanco	Jim Hogg	Terry	Colorado	Parmer
Gregg	Fort Bend	Bosque	Jim Wells	Throckmorton	Comanche	Pecos
Harris	Guadalupe	Brooks	Jones	Tyler	Cottle	Presidio
Hidalgo	Hardin	Burleson	Karnes	Upton	Crockett	Real
Jefferson	Harrison	Burnet	Kendall	Van Zandt	Culberson	Reeves
Lubbock	Hays	Calhoun	Kenedy	Walker	Dallam	Roberts
McLennan	Henderson	Callahan	Kleberg	Ward	Dawson	Sabine
Midland	Hood	Camp	La Salle	Washington	Dickens	San Augustine
Nueces	Hunt	Carson	Lamb	Wharton	Donley	San Saba
Potter	Johnson	Cass	Lampasas	Wilbarger	Eastland	Scurry
Smith	Kaufman	Castro	Lavaca	Willacy	Edwards	Shelby
Tarrant	Liberty	Cherokee	Lee	Winkler	Foard	Sherman
Taylor	Montgomery	Clay	Leon	Wise	Franklin	Stephens
Tom Green	Orange	Coke	Limestone	Wood	Frio	Stonewall
Travis	Parker	Coleman	Live Oak	Young	Gaines	Sutton
Victoria	Randall	Concho	Lynn	Zapata	Gillespie	Terrell
Webb	Rockwall	Cooke	Madison		Gray	Titus
Wichita	San Patricio	Crane	Marion		Hall	Trinity
	Upshur	Crosby	Martin		Hansford	Uvalde
	Waller	Deaf Smith	Matagorda		Hardeman	Val Verde
	Williamson	Delta	Maverick		Haskell	Wheeler
	Wilson	DeWitt	McMullen		Hemphill	Yoakum
		Dimmit	Medina		Houston	Zavala
		Duval	Menard		Howard	
		Erath	Milam		Jeff Davis	
		Falls	Moore		Kent	
		Fannin	Morris		Kerr	
		Fayette	Navarro		Kimble	
		Fisher	Newton		King	
		Floyd	Nolan		Kinney	
		Freestone	Oldham		Knox	
		Garza	Palo Pinto		Lamar	
		Glasscock	Panola		Lipscomb	
		Goliad	Polk		Llano	
		Gonzales	Rains			
		Grimes	Reagan			
		Hale	Red River			
		Hamilton	Refugio			
		Hartley	Robertson			