
Demographic and Commuting Trends in Delaware

**prepared for
the Delaware Department of Transportation**

by

**Edward C. Ratledge
David P. Racca**

**Center for Applied Demography and Survey Research
College of Urban Affairs and Public Policy
University of Delaware
Newark, Delaware 19716**

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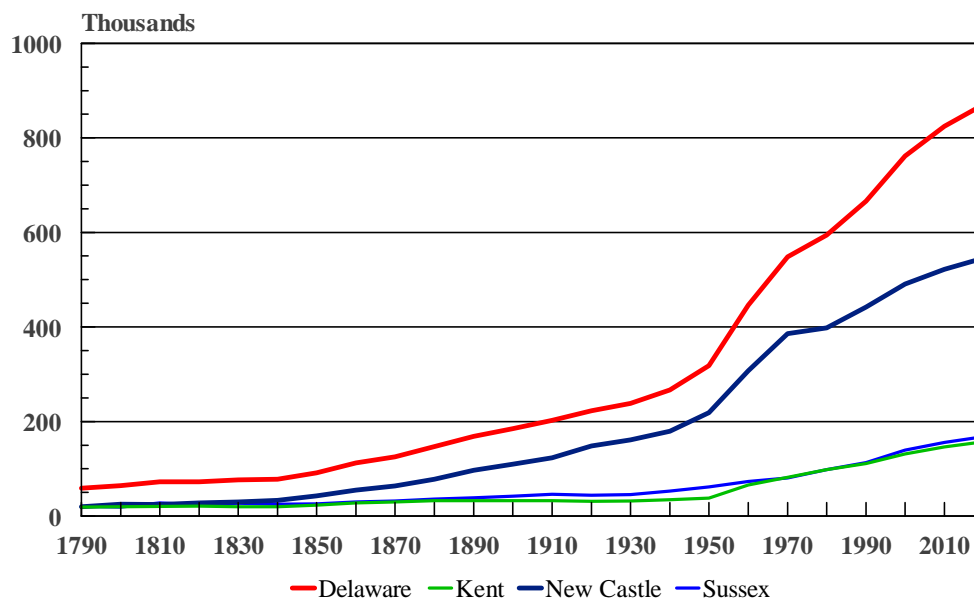
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Population and Households

Introduction

There are many factors which influence the need and distribution of transportation services, but few are more important than the population base that uses those services. In this section of the report, several population-related issues will be addressed. These will include population growth, the components of that growth, the impact and structure of migration, the way the population is organized in households, and finally, aspects of the age structure of the population.

Figure 1-1
Population of Delaware and Counties

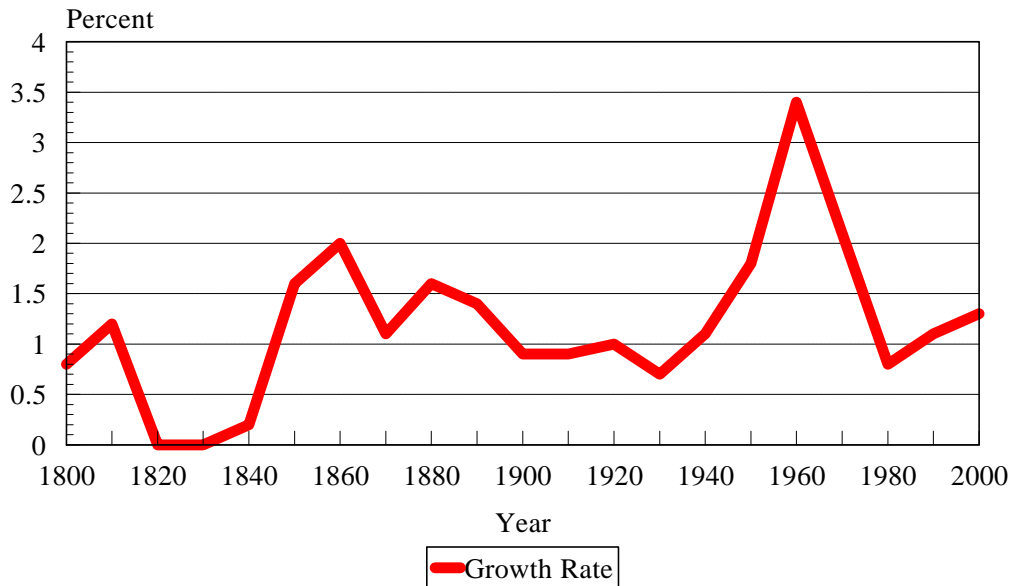


Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census Decennial Census 1790-1990
Delaware Population Consortium, January 1996

Population Growth

The pattern of population growth from 1790 to 2020 for the state and each county is displayed in Figure 1-1 above. The graph reflects a pattern seen quite often in nature where a population grows at a stable but increasing rate, followed by a time where rates increase each period, and finally by one that increases but with the rate decreasing over time. The State of Delaware, and New Castle County in particular, have experienced these three phases of growth.

Figure 1-2
Annual Average Population Growth Rates
Delaware 1790-2000



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census Decennial Census 1790-1990
Delaware Population Consortium, January 1996

Figure 1-2 shows the acceleration in growth that began after the low point during the Depression in the 1930's. The state grew at a fairly steady rate from 1840 to 1950, after which population growth began to explode. This pattern continued unabated for 20 years until the oil-crisis induced recession and the migration to the sunbelt began. More recently, growth rates have returned to average levels experienced during the past two hundred years. There is little reason to expect either a rapid increase or decrease in these traditional levels absent a major economic shock or some trigger that makes Delaware an undesirable place to live and work.

Kent and Sussex counties continue to grow at rates which are consistent with those of the state throughout the last century. At this point, there is nothing to suggest the onset of rapid growth rates of the type observed in New Castle County, from 1950-1970, although projections suggest significantly higher rates of population growth in Kent and Sussex counties during this decade than those observed in New Castle County. In absolute terms, however, the growth in New Castle County will be a bit larger than that of Kent and Sussex combined (Figure 1-3, below.)

**Figure 1-3
State of Delaware and
County Populations 1790-2000**

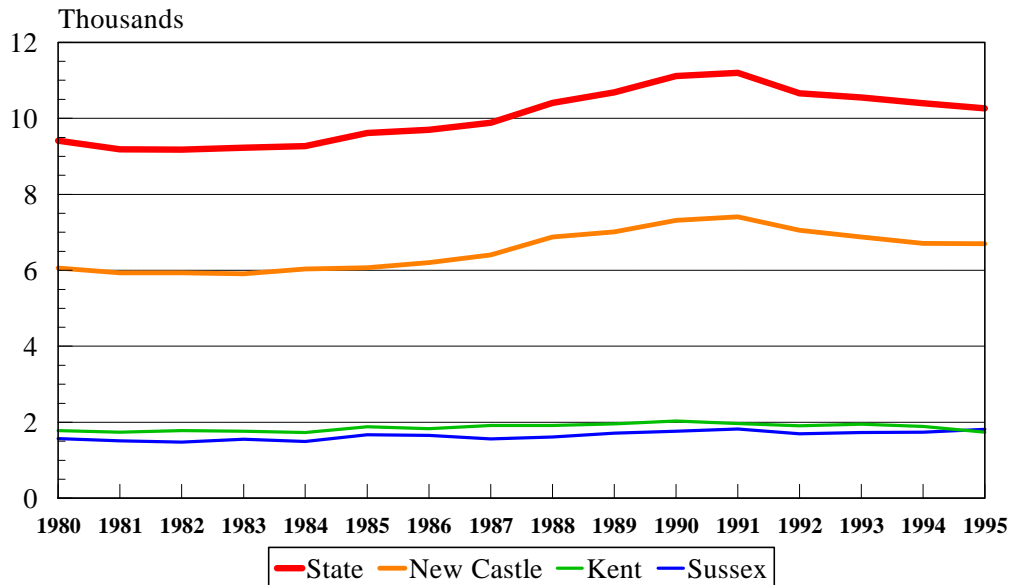
Year	State	Growth Rate	Kent	New Castle	Sussex
1790	59,096	----	18,920	19,688	20,488
1800	64,273	0.8%	19,554	25,361	19,358
1810	72,674	1.2%	20,495	24,429	27,750
1820	72,749	0.0%	20,793	27,899	24,057
1830	76,748	0.0%	19,913	29,720	27,115
1840	78,085	0.2%	19,872	33,120	25,093
1850	91,532	1.6%	22,816	42,780	25,936
1860	112,216	2.0%	27,804	54,797	29,615
1870	125,015	1.1%	29,804	63,515	31,696
1880	146,608	1.6%	32,874	77,716	36,018
1890	168,493	1.4%	32,664	97,182	38,647
1900	184,735	0.9%	32,762	109,697	42,276
1910	202,322	0.9%	32,721	123,188	46,413
1920	223,003	1.0%	31,023	148,239	43,741
1930	238,380	0.7%	31,841	161,032	45,507
1940	266,505	1.1%	34,441	179,562	52,502
1950	318,085	1.8%	37,870	218,879	61,336
1960	446,292	3.4%	65,651	307,446	73,195
1970	548,104	2.1%	81,892	385,856	80,356
1980	594,338	0.8%	98,219	398,115	98,004
1990	666,168	1.1%	110,993	441,946	113,229
2000	761,491	1.3%	131,344	490,665	139,482

Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census
Delaware Population Consortium, January 1996

Components of Growth

Overall population growth is dependent upon two components: natural increase and net migration. Natural increase is the number of births to Delaware residents less the number of Delaware residents who die. That quantity is represented by the lightest curve in Figure 1-3 and has been around 4,000 per year until the “baby boomlet” started in 1985 and ended in 1991. The most recent trends in births are found in Figure 1-4, below.

Figure 1-4
Births by Mother's County of Residence
1980-1995

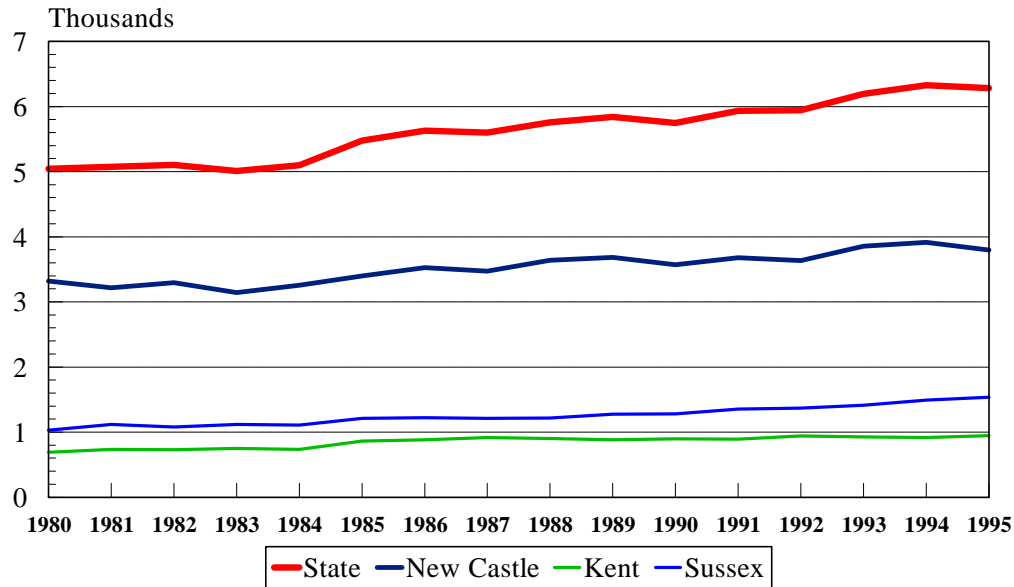


Source: Center for Applied Demography and Survey Research, University of Delaware
Delaware Health Statistics Center

The figure shows the impact of the boomlet. The pattern, however, was distinctly different by County. Kent County births increased and then declined back to levels experienced prior to the beginning of the trend. New Castle County experienced the largest increase in births and has now declined and seemingly stabilized at a level well above the earlier trend line. Sussex County births increased steadily and are today close to the 1991 peak. The difference in the performance of the three counties illustrates the fact that there are almost certainly different demographic dynamics occurring in each.

The other part of natural increase is death or mortality. These patterns are highly predictable since they are almost entirely a function of age. Kent County has the youngest population with a median age of 32. New Castle County and Sussex County have median ages of 33 and 36 respectively. For this reason alone, the number of deaths expected in Sussex County should be increasing more rapidly than in the other two. This is shown in Figure 1-5, below.

Figure 1-5
Deaths by Decedent's County of Residence
1980-1995



Source: Center for Applied Demography and Survey Research, University of Delaware
 Delaware Health Statistics Center

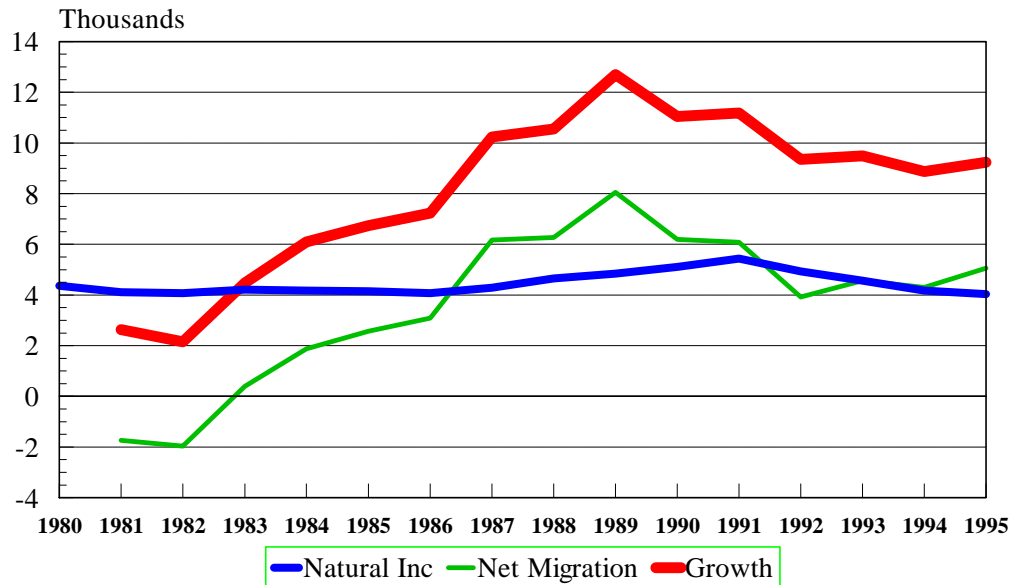
As expected, the absolute number of deaths is increasing. Both the increase in the population overall during the period and the aging of that population guarantees that result. Kent County shows an increase, but a significantly smaller one, even though the populations of Kent and Sussex counties are similar in size. Age structure definitely counts.

Figure 1-6, below, illustrates the components of Delaware's population growth since 1980. Annual population growth, which is represented by the darkest line in the graph has been as low as 2,000 persons, in 1982, at the end of the recession. It was as high as 13,000 persons, when the economy peaked in 1989. Natural increase (births-deaths) has been remarkably stable, around 4,000 persons annually during the period, and today is about where it began in 1980. However, this component of growth is likely to decline over the longer term as the effect of an aging population (the Boomers) begins to offset the increases in births coming from the baby boomlet. Almost all of the shape of population growth is now being dictated by the other component, net migration.

Net migration, which is the result of persons moving into Delaware less persons moving out of Delaware, is clearly the volatile component of the growth picture. It has moved from net out-migration of -2000 in 1982 to a high of +8000 net in-migration at the peak of the economic

cycle in 1989. It then fell during the recession years of the early 1990s and today accounts for slightly more than half of all population growth.

Figure 1-6
Sources of Population Growth in Delaware



Source: Center for Applied Demography and Survey Research, University of Delaware

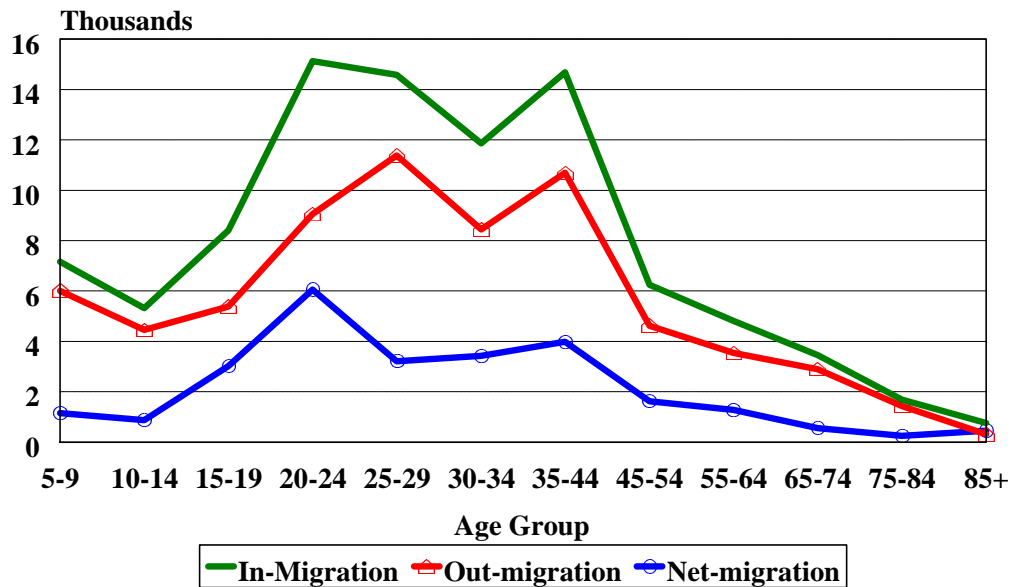
These data suggest that Delaware's population growth is heavily influenced by local labor market conditions. Delaware's economy has consistently produced unemployment rates below those for the nation and region and has continued to generate new jobs sufficient to attract net in-migration. However, employment is not the only attraction. Sussex County, which depends on net in-migration for about 80% of its population growth, attracts retirees. Those retirees generate new economic activity and employment for others who then move here. The next set of figures illustrates the complexity of this process.

Migration

Figure 1-7 shows total in-migration, out-migration, and net-migration for Delaware from 1985 to 1990. It represents the most recent five year data available. It also is quite similar to the county level tax-migration data issued by the IRS for the period 1990-1994. For this reason, it is treated as representative of current migration activity. The lightest line on the chart represents net migration. It shows net in-migration for every age group, but the vast amount of net in-migrants

are between the ages of 15 and 45. The largest group (20-24) is probably unduly influenced by the out-of-state population attending the University of Delaware, but it also reflects the availability of jobs in Delaware for recent graduates that holds them in the state.

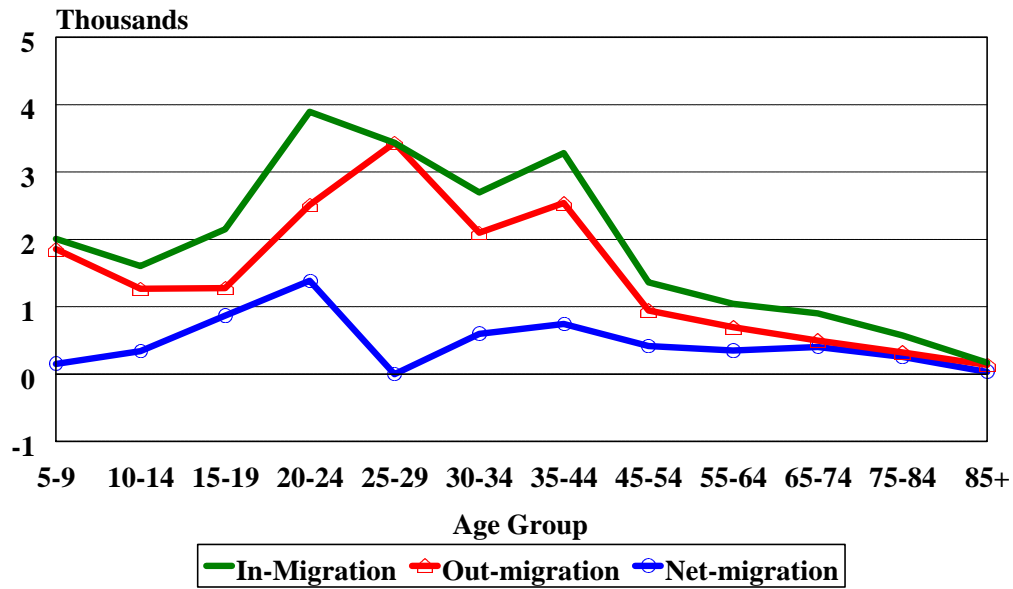
Figure 1-7
Migration in Delaware 1985-1990
by Age Group



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

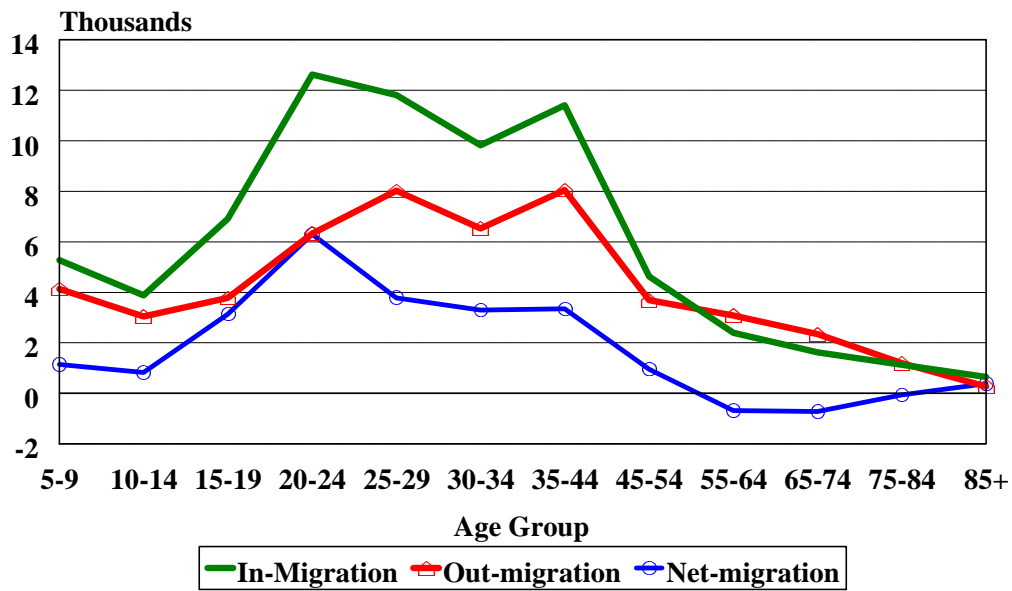
Further, those in the 20-35 age group are probably more mobile and are more willing to take risks to improve their economic circumstances. Overall the 65 and over group, while positive for migration, is not a major contributor to the state's overall growth. This, however, will vary by county, as will be shown in the next set of exhibits.

Figure 1-8
Migration in Kent County 1985-1990
by Age Group



Source: Center for Applied Demography and Survey Research, University of Delaware
 U.S. Bureau of Census

Figure 1-9
Migration in New Castle County 1985-1990
by Age Group

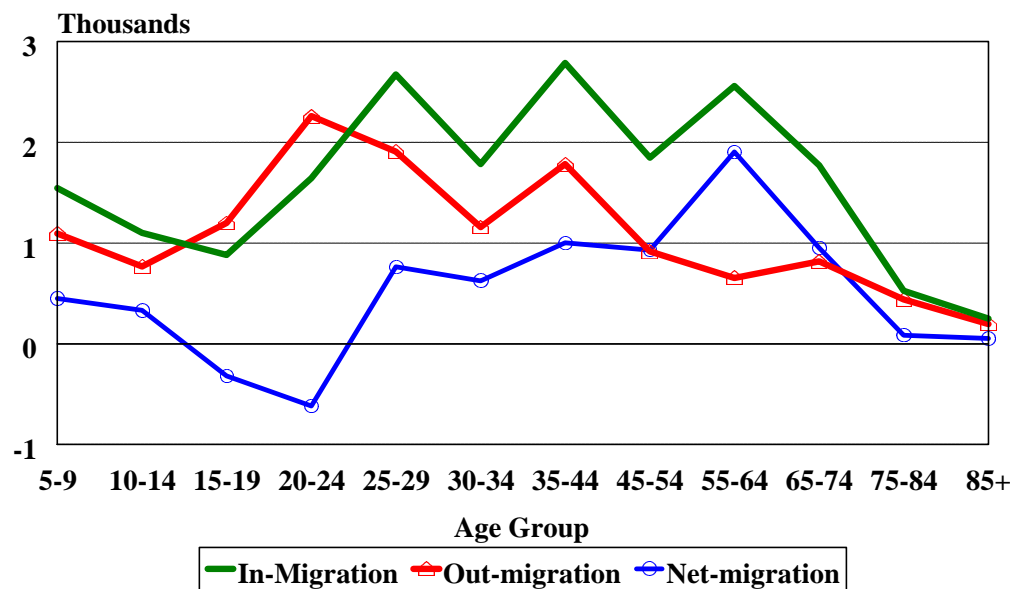


Source: Center for Applied Demography and Survey Research, University of Delaware
 U.S. Bureau of Census

The pattern for net-migration in Kent County (Figure 1-8) has much the same shape as the state's. The peak is in the 20-24 age group, perhaps influenced by Dover Air Force Base, and there is a drop in the 25-29 age group. This drop is much more exaggerated than for the state, with net migration falling to zero before rising with the 30-44 age groups. This might be influenced by Delaware State University and the air base, but may also reflect the relative sparseness of job opportunities in the county. The older age groups are much more stable, with a significant number of the 65+ group migrating to Kent County. These may include military retirees returning to the Dover area.

The principal features of migration in New Castle County shown in Figure 1-9, above, are the very strong migration in the 20-44 age groups and the net out-migration in the 55-74 age groups. These may represent people leaving the corporate headquarters companies to retire elsewhere but may also reflect retirement to a vacation home in Sussex County. New Castle County is the only county that shows net out-migration of older residents. These data also suggest that the labor market is strong for the younger age groups and that net in-migration will help provide labor for those companies that wish to expand.

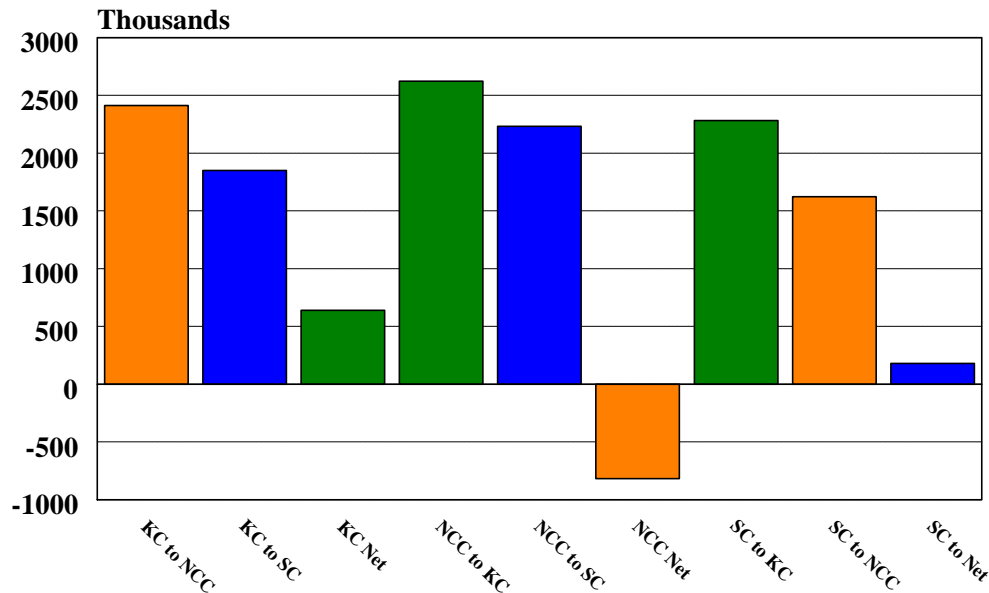
Figure 1-10
Migration in Sussex County 1985-1990
by Age Group



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Sussex County, not unexpectedly, has a highly distinct different migration profile. There are three distinctly different aspects of the profile. First, there is net out-migration in the 15-24 age group. This may represent young people leaving for school, different job opportunities, or simply the lack of major educational or military institutions found in Kent and New Castle counties. Second, there is solid net in-migration in the 25-44 age groups which suggests that there are job opportunities being created in Sussex County. These are being created, at least in part, by the net in-migration of the older age groups. A substantial part of total net-migration in Sussex County falls into these older age groups. In contrast with the state profile, the 44-64 age groups show significant growth from migration and that growth continues although at a lower level up until age 75.

Figure 1-11
Internal Migration in Delaware 1985-1990
by County



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Finally, the internal migration in Delaware is shown in Figure 1-11. There is movement between the counties over the period with about 12,000 people changing counties. New Castle County is the only net loser and Kent County gained the most. Both Sussex and New Castle lost population to Kent and New Castle lost population to both Kent and Sussex counties. The largest single movement, approximately 500, was from New Castle to Sussex. Since New Castle also experienced net out-migration for the older age groups, a portion of this shift is probably from retirees.

Net migration is extremely important to Delaware. It is the most dynamic force in creating population growth. It can significantly alter the age structure of the population and thus alter its demographic profile. It can serve to increase or decrease the supply of labor and thereby alter the attractiveness of Delaware as a place to live and work. All of these factors will affect the demands for transportation infrastructure in the state.

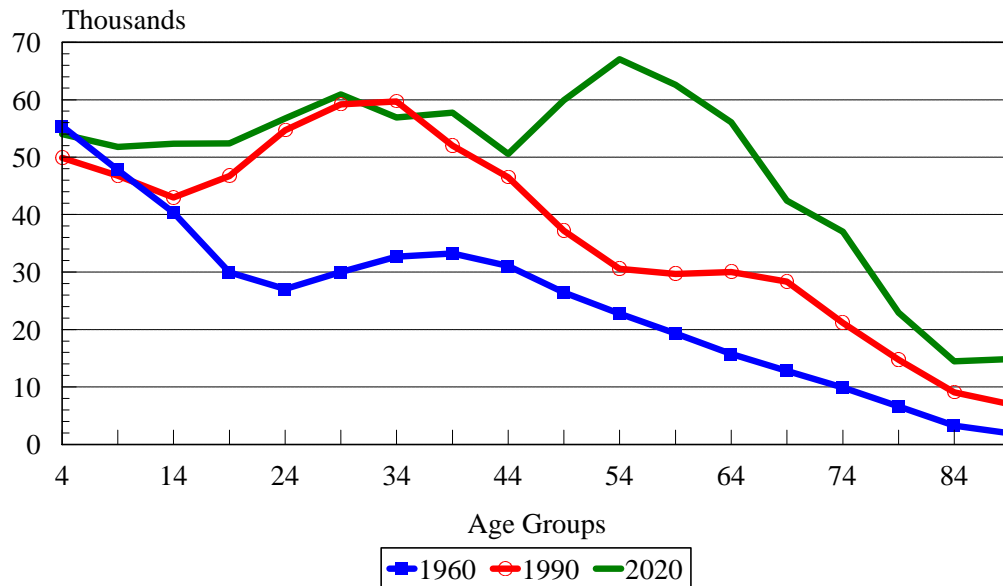
Age Structure

Age matters. It matters because there is a life-cycle and the activities and decisions that people make are different at different points on that cycle. When viewed in aggregate, changes in the age structure can be a powerful predictor of the collective choices that a population will be making now and in the next twenty years. For example, the “baby bust” helped lower the crime rate and reduced the rate of family formation as they aged. The “baby boomlet” has already had a significant impact on the schools and will likely lead to another surge in the crime rate and a significant increase in rate of household formation. The “baby boomers” are now adding to the overall household income of the state and will eventually cause a crisis in social security and health care.

All of these groups are clearly visible in Figure 1-12, below. The bulge of about 60,000 people passing through the distribution are the Delaware Boomers. In 1990, the largest group is about 34 years old. In thirty years they are centered at 55 years of age rather than 64 because the leading edge is suffering from the attrition of old age. It is also interesting to see that the numbers in this age group increase over the next twenty years largely because of the positive net immigration of those groups as was noted in the earlier discussion. Overall, this group should be experiencing significant increases in income and their choices and activities should reflect that.

The baby bust is clearly identifiable in the graph since the population declines to about 42,000 in the 10-14 age group in 1990. From there, the numbers rise as the baby boomlet appears on the scene.

Figure 1-12
Age Structure in Delaware
1960-2020



Source: Center for Applied Demography and Survey Research, University of Delaware
 U.S. Bureau of Census

At the high end of the age distribution, the increasing number of older Delawareans is clearly visible with the number in the 70-74 age group increasing by nearly 20,000 over the thirty years from 1990 to 2020. The increases in these older age groups will probably have a significant impact on the need for public services at a time when overall incomes will almost certainly be declining relative to their peak earning years.

Household Composition

Household formation and composition are key factors in deciding how the population is distributed across the landscape of the state. New households are created by young adults leaving their parent's household. They are also created when a household is split apart by divorce. Households are also destroyed when two households are combined by marriage or other arrangement (e.g., parents or children move back home.)

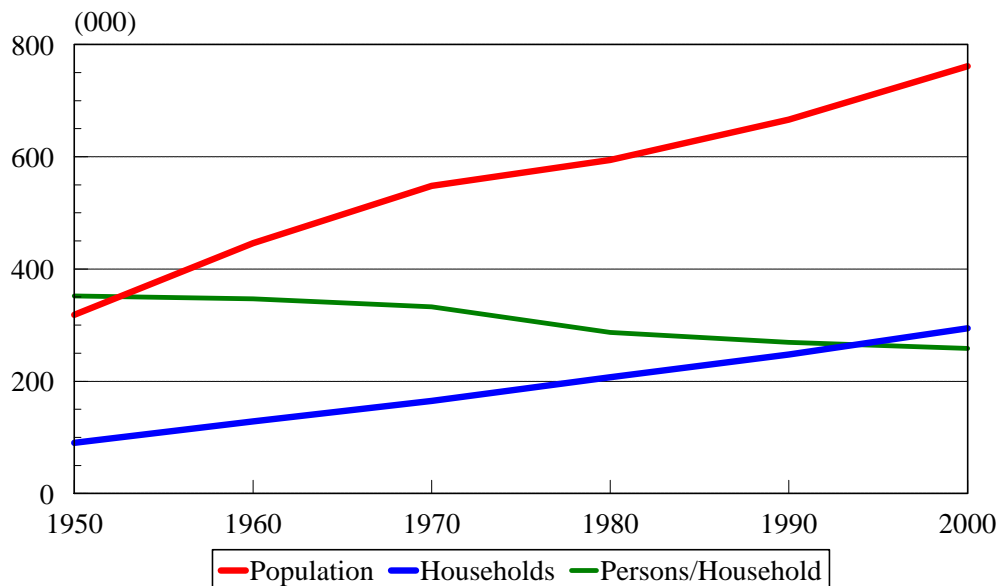
Household composition also changes as household formation occurs. The two single person households become a husband-wife household at marriage. At divorce, the "traditional family with children" becomes a single person living alone and a single parent household. The size of the household is also affected by births and deaths within the household. The rate and

shape of all these various factors can have a profound effect on everything from households in poverty to the journey to work.

Figure 1-13, below, illustrates several significant trends in household formation during the last half century. First of all, the annual rate of growth in households over the period was 2.4% while the annual rate of growth was 1.8%. The difference is even more dramatic over the decade of the 1980's when population grew at 1.1% and households expanded at an annual rate of 1.8%. The net effect of these differential growth rates leaves with an average household size that has declined from 3.4 persons per household, in 1950, to 2.6 per household expected in the year 2000.

There are three major reasons for the drop in household size. First, the number of children that women expect to have over their lifetimes has fallen significantly. Further, the age at first marriage and the proportion of women that never marry have increased. All of these factors have cut general fertility rates by about 40%. Much of this is related by the unprecedented increase in female labor force participation rates which have risen from about 30% to more than 60% over the last 50 years.

Figure 1-13
Population and Households in Delaware
1950-2000

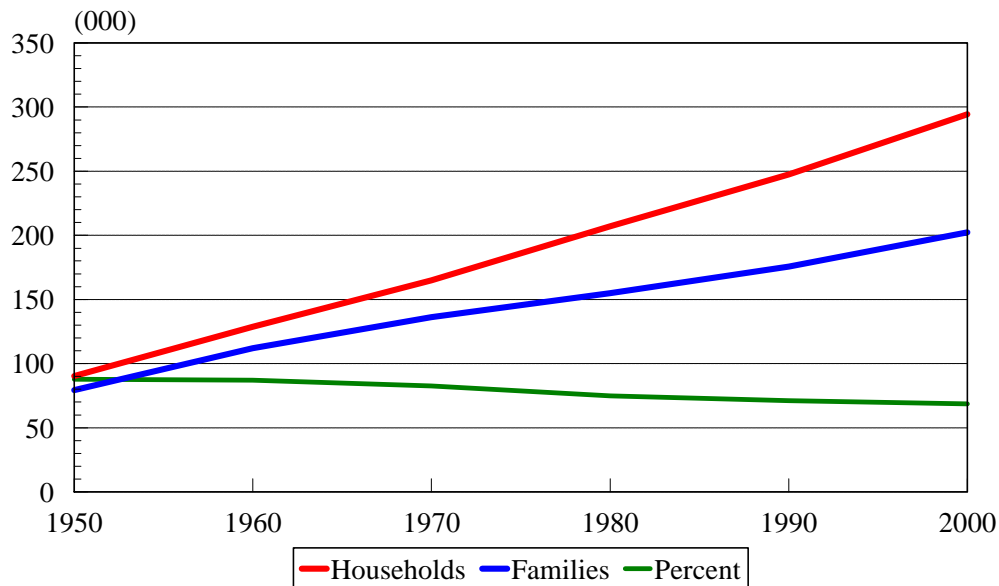


Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

The second major reason is the increase in the number of single parent households brought about by the increase in the rate of divorce and by the increased growth rate in households headed by women who have never married and have children. Both of these factors reflect major shifts in societal attitudes over the last fifty years.

The final reason is longevity. The “traditional family” of two adults and two children begins the cycle with a household size of four. It declines to two after the children leave home and then to one when the first adult dies. As longevity increases, the period of time when the household size is either two or one also expands. As those older adults stay longer and longer in the family home, the time when that housing unit will be “back-filled” by a larger household increases. Taken together with the other two factors, it is hard to see at what point household size will cease its downward drift; certainly not until the “boomers” pass on well into the next century.

Figure 1-14
Households and Families in Delaware
1950-2000



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

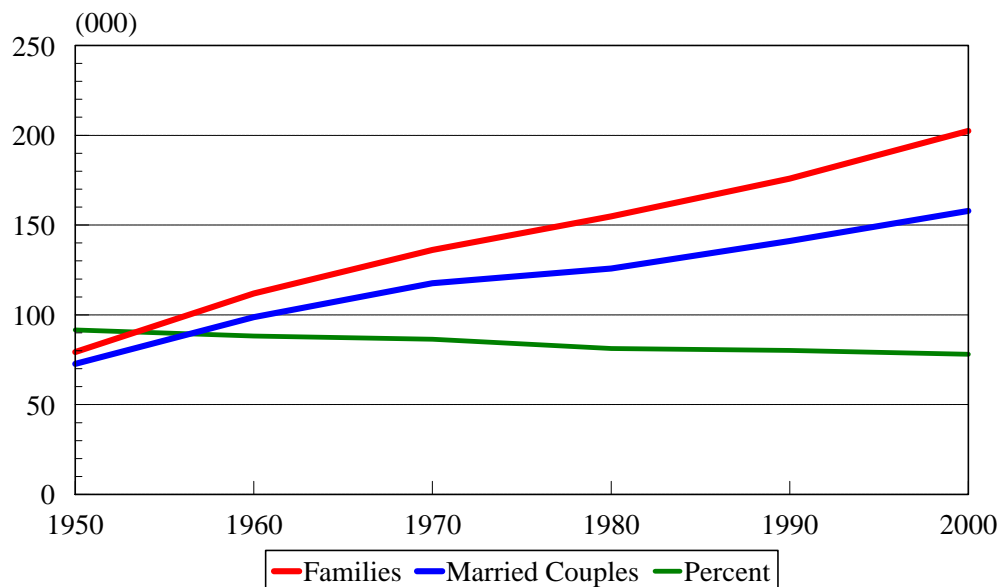
Families are a particular type of household. Families are those households that contain two or more people who are related by marriage or blood. This contrasts with households made up of a single person or a group of unrelated individuals e.g. roommates. Except in unusual

cases, children are always found in families or in a non-household entity called group quarters (e.g., orphanage, boarding school.)

Figure 1-14, above, shows the relationship between families and households. It is one where families are a majority, but a sharply declining majority of households over the past 50 years. This trend largely results from a rapid increase in the number of single person households propagated by divorce, later marriage, and longevity coupled with more households made up of unrelated adults.

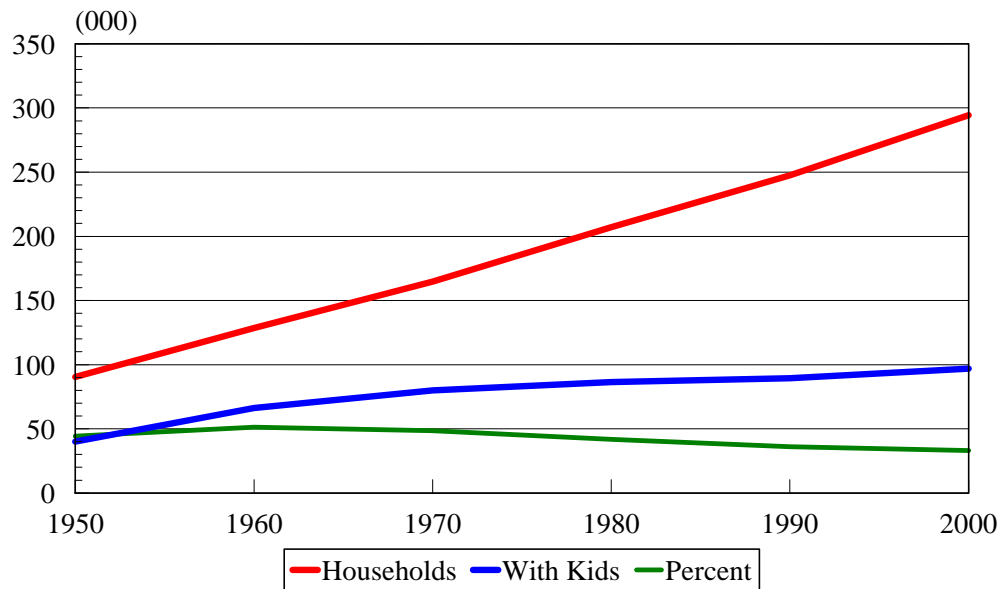
The structure of families is also changing, as is shown in Figure 1-15, below. In 1950, 91% of all families were of the husband-wife structure with or without children. Today that proportion has fallen to below 80%. This decline has been caused by an acceleration in the creation of single parent households. It also means that adults are spread out across a larger number of households than would have been the case in 1950.

Figure 1-15
Families and Husband-Wife Families in Delaware
1950-2000



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Figure 1-16
Households with Children under 18 in Delaware
1950-2000



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Finally, the number of households with children under 18 has fallen significantly from 51%, in 1960, to approximately 33% today. This change in composition has a significant impact on the choices and actions undertaken by households.

Housing Stock

Delaware's housing stock has also been changing. The choices people make about the type of housing they will occupy has ramifications for land-use and transportation among other issues. In Figure 1-17, below, the largest majority still choose the single family home, although the share has dropped from 76.4% to 69.8% over the past twenty years. Multi-family units increased in popularity during the seventies as the Boomers reached an age to leave home and form new households. However, the trend reversed in the 1980's where multi-family units captured a smaller share of the housing market, although the absolute numbers of units still increased. Mobile homes also increased in numbers and share during the last two decades. In fact, that category grew faster than either of the other two and today serves nearly 10% of the households in the state.

Figure 1-17
Occupied Year Round Housing Stock
in Delaware 1970-1990

State of Delaware

Structure	1990 Units	1990 Percent	1980 Units	1980 Percent	1970 Units	1970 Percent
Single Family	170,011	69.8	149,314	72.1	125,929	76.4
Multi-Family	50,554	20.8	43,950	21.2	31,156	18.9
Mobile Homes	22,906	9.4	13,817	6.7	7,719	4.7
Total	243,471	100.0	207,081	100.0	164,804	100.0

Kent County

Structure	1990 Units	1990 Percent	1980 Units	1980 Percent	1970 Units	1970 Percent
Single Family	25,582	64.5	22,952	70.1	16,393	70.1
Multi-Family	5,541	14.0	4,890	14.9	3,874	16.6
Mobile Homes	8,532	21.5	4,895	15.0	3,101	13.3
Total	39,655	100.0	32,737	100.0	23,368	100.0

New Castle County

Structure	1990 Units	1990 Percent	1980 Units	1980 Percent	1970 Units	1970 Percent
Single Family	118,847	72.4	99,435	71.6	88,075	76.1
Multi-Family	39,472	24.0	36,436	26.2	25,468	22.0
Mobile Homes	5,842	3.6	3,073	2.2	2,231	1.9
Total	164,161	100.0	138,944	100.0	115,774	100.0

Sussex County

Structure	1990 Units	1990 Percent	1980 Units	1980 Percent	1970 Units	1970 Percent
Single Family	29,673	67.9	26,927	76.1	21,461	83.6
Multi-Family	3,045	7.0	2,624	7.4	1,814	7.1
Mobile Homes	10,963	25.1	5,849	16.5	2,387	9.3
Total	43,681	100.0	35,400	100.0	25,662	100.0

Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Most of the trends observed in the state-wide data are replicated in the county figures. There are however differences in the magnitude of those changes. Kent County continues to have the smallest proportion of occupied housing in single family units. In addition, the growth in multi-family units in Kent County lagged the growth rate for the state. This resulted in an overall reduction in multi-unit construction's share of the housing market. Mobile homes more than doubled over the period and gained additional share as the growth rate matched that of the state.

New Castle County still remains the bastion of the single family home. While the share did decline, that category fell the least among the counties and today is still over 70%. Multi-unit structures continued to increase but at a much slower pace than that during the first decade. Mobile homes grew in New Castle County at the state average rate but have a significantly smaller share of the market than is evidenced in either of the other two counties.

Sussex County is a somewhat different case. It's overall growth is heavily influenced by in-migration. Many of those in-migrants move into mobile homes that were previously used as seasonal housing. For that reason, the growth in occupied, year round mobile homes increased at a rate 50% faster than that observed in the state overall. This growth allowed mobile homes to increase their share from 9% to 25% during the period largely at the expense of single family homes.

Mobile homes are one of the solutions to affordable housing, and that solution has been chosen extensively in Kent and Sussex counties. That choice has reduced the need for rental units which is reflected in the smaller shares for multi-unit construction when compared to New Castle County. There is little doubt that the lower income levels coupled with the lower densities add to this mix in Kent and Sussex counties. There have been difficulties gaining public approval for large scale mobile home parks in New Castle County. Finally, mobile homes are more likely to be dispersed much like a housing development in contrast to the settings for most multi-unit development. Given the fact that they are nearly 20% of the new housing over the last twenty years, more attention needs to be given to the long run implications of this choice.

Employment and Income

Introduction

The shape, size, and spatial distribution of employment in Delaware has a profound impact on the journey to work. People are sensitive to the journey to work and tend to choose housing, other things equal, with a drive-time distance with which they are comfortable.

Employment is, however, not static and it changes in many ways over time. Those changes will alter the way people choose their residences. Wage levels and job security will be influential in a variety of ways. These can vary by industry and occupation. As employment opportunities change in either dimension, there will be corresponding changes in the way people make choices.

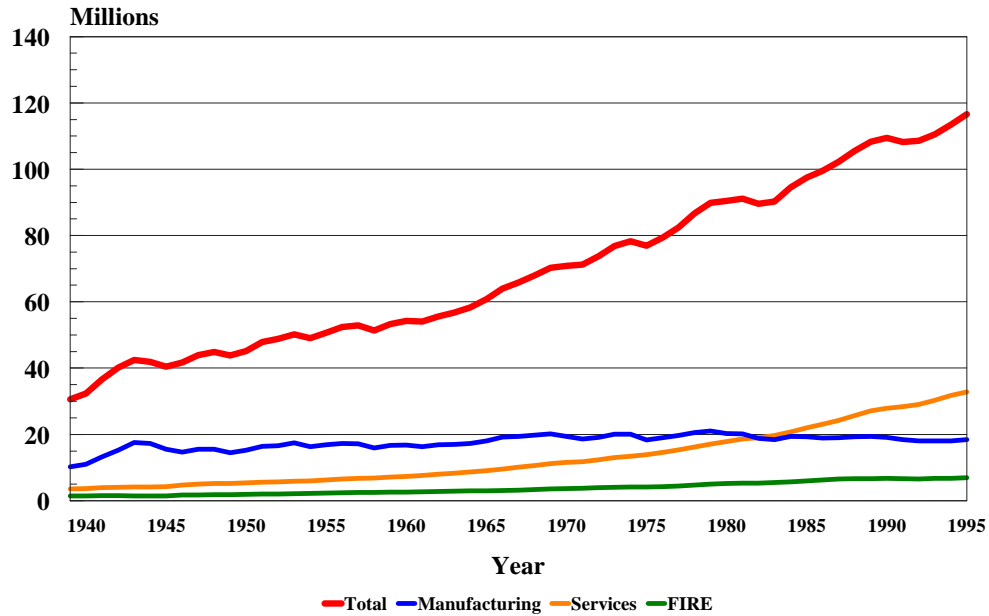
In this section, employment will be examined in several ways. The trends that are revealed will have an impact on the journey to work.

Employment by Sector

In Figure 2-1, below, the total employment for the United States from 1939 through 1995 is shown along with three of the ten employment sectors namely: manufacturing, services, and FIRE (finance, insurance, and real estate). The graph clearly shows the impact that the business cycle has had on total employment in the mid-1970s, the early 1980s, and the early 1990s.

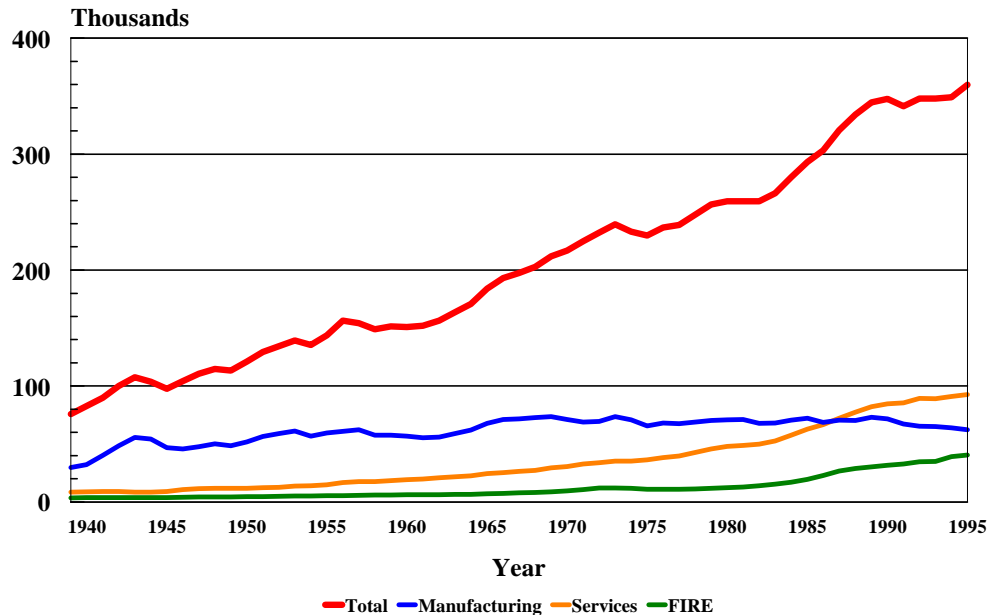
The more subtle influence is related to the change in the structure of employment. Manufacturing employment peaked in the late 1970s and has been in a steady, although very shallow decline since. Service industry employment increased steadily over the entire period and began accelerating its growth when manufacturing employment was at its peak. In 1981, service sector employment surpassed manufacturing employment, and today it accounts for nearly twice as much employment as manufacturing. This trend will probably continue unabated for the foreseeable future.

Figure 2-1
US Non-Agricultural Employment:
Selected Sectors



Source: Center for Applied Demography and Survey Research, University of Delaware
 US Bureau of Labor Statistics

Figure 2-2
Delaware Non-Agricultural Employment:
Selected Sectors

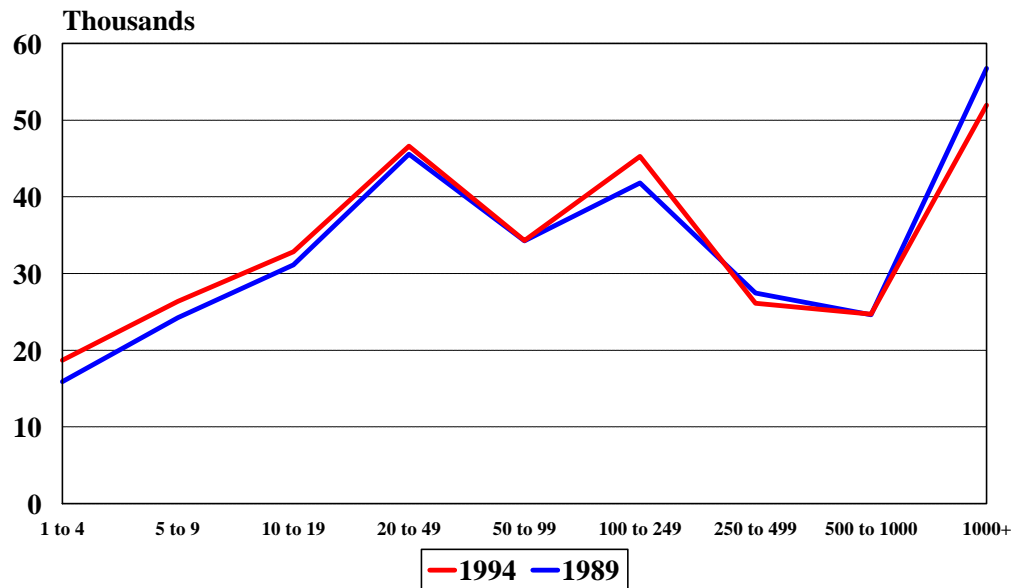


Source: Center for Applied Demography and Survey Research, University of Delaware
 U.S. Bureau of Labor Statistics, Delaware Department of Labor

The pattern was similar in Delaware (Figure 2-2 above) although the recession of the mid-1970s was more severe and the later ones were perhaps less damaging than they were nationwide. For instance, statewide manufacturing employment peaked during 1989. This marked the end of the expansion of the 1980s. Since then, the number of manufacturing jobs available to Delawareans has dropped significantly and continues to fall even today.

In 1986, four years after it happened nationally, statewide service industry employment surpassed manufacturing employment. The rate of growth in service sector employment in recent years has slowed somewhat compared with the rate for the U.S., but this has been offset by the incredible growth in the FIRE sector. Employment in the FIRE sector clearly exploded after the passage of the Financial Center Development Act in the early 1980s. It continued to grow dramatically until the 1990-1991 recession. To most observers' surprise, the growth re-ignited in 1992 and continues today. A comparison of the trends in Figure 2-1 and Figure 2-2 show this to be a Delaware phenomenon.

Figure 2-3
Delaware Employment by Size of Firm
1989 and 1994



Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau Census, County Business Patterns 1989, 1994

The decline in manufacturing jobs and the increase in service jobs is to some degree misleading. As manufacturing firms continue to down size, they also tend to out-source many

functions that were previously accomplished by their own employees. These functions might include public relations, data processing, and many others. As a result, those functions may take the same number of people, but those people are now classified as part of the service sector rather than manufacturing. To the extent that this occurs, there has been a reclassification rather than an outright loss of jobs.

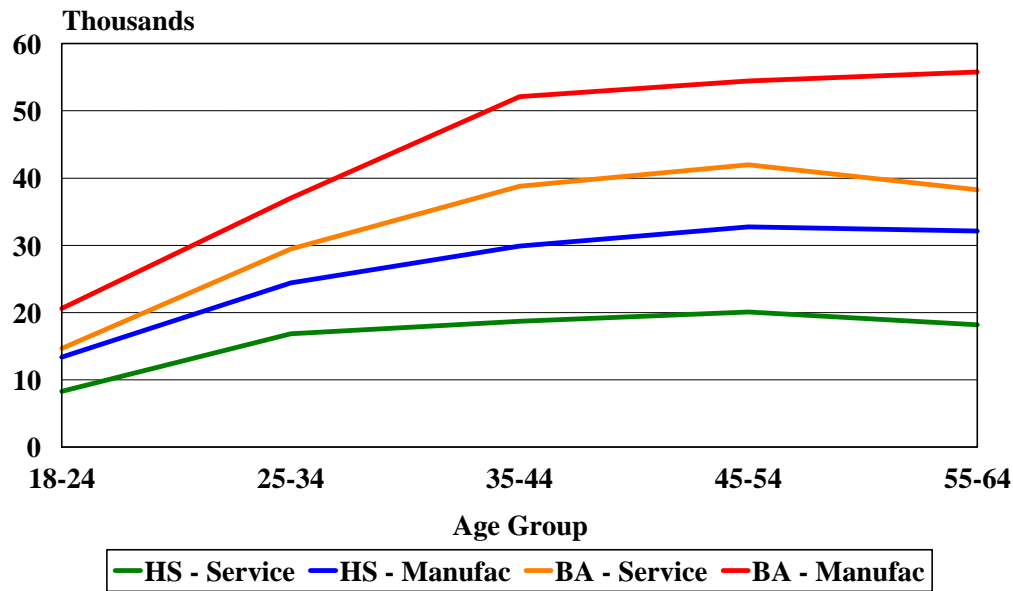
The other important change that takes place is that the jobs may become much less dense spatially. Typically, a large company will tend to concentrate its employees in a limited number of places. As these jobs are decentralized to service sector firms, the jobs are likely to be much less concentrated. In fact, the typical manufacturing location has more than three times the number of employees as an establishment in the service sector. The effect of these changes on firm size is shown in Figure 2-3, above. There are clearly fewer employees at the high end of the size spectrum in 1994 than there were in 1989. Correspondingly, there are more small and medium to large firms in 1994.

Another important factor in these inter-sector employment shifts is shown in Figure 2-4, below. Figure 2-4 shows the average annual earnings by age, education, and industrial sector. The top two lines represent annual earnings for college graduates in the manufacturing and service sector respectively. The bottom two lines depict the same information for high school graduates in the same two sectors.

The graph shows a difference of about \$10,000 in annual earnings between the two sectors at the mid-career age level holding the level of education constant. There are a number of reasons for this difference. For example, those employed in manufacturing are much more likely to be represented in a collective bargaining unit, a union. They are also more likely to work full-time with significant overtime.

In contrast, service sector workers are more likely to be employed by non-union companies and are much more likely to work part-time. These factors, coupled with the increasing number of service sector workers relative to the number of manufacturing workers, will tend to impact the choices people make. On the bright side, there are indications that the differential may decline over time. Many of the jobs currently being out-sourced are high paying jobs. As those are incorporated into the service sector, the overall wages of service sector jobs will rise. This is unlikely to affect those with just a high school education, who will find it much more difficult to find a job in the manufacturing sector.

Figure 2-4
Average Annual Earnings by
Sector, Age, and Education in 1994



Source: Center for Applied Demography and Survey Research, University of Delaware
 U.S. Bureau of Census, Current Population Survey, March 1995

Employment Status

Another factor that exerts influence on the shape and size of employment is the labor force participation rate. These are shown in Figure 2.5, below, for the period 1970 through 1990. In Figure 2.5, *Employed* refers to persons rather than jobs. The column labeled *Population* refers to the civilian population 16 years and older. Military personnel are excluded from both *Employed* and *Population*.

There has been a significant increase overall in the labor force participation rate in Delaware during the period from 57.7% to 65.3%. That rate increased even more rapidly during the 1980's than it had during the previous decade. The primary reason for the increase was a substantial increase in the labor force participation rate for women. During the period, the labor force participation rate for men actually fell and then rose again during the economic expansion that followed the 1980 recession. Altogether, women took about 60% of the jobs created in those two decades.

Figure 2-5
Employment Status
for Civilians 16 Years of Age and Older

State of Delaware

		1990			1980			1970	
	Employed	Population	Rate	Employed	Population	Rate	Employed	Population	Rate
Total	335,147	513,564	65.3%	262,809	445,337	59.0%	210,927	365,373	57.7%
Men	176,287	242,753	72.6%	148,811	208,410	71.4%	131,630	170,732	77.1%
Women	158,860	270,811	58.7%	113,998	236,927	48.1%	79,297	194,641	40.7%

Kent County

		1990			1980			1970	
	Employed	Population	Rate	Employed	Population	Rate	Employed	Population	Rate
Total	51,615	79,799	64.7%	38,744	66,604	58.2%	27,233	48,198	56.5%
Men	27,030	36,848	73.4%	21,000	30,021	70.0%	16,004	21,266	75.3%
Women	24,585	42,951	57.2%	17,744	36,583	48.5%	11,229	26,932	41.7%

New Castle County

		1990			1980			1970	
	Employed	Population	Rate	Employed	Population	Rate	Employed	Population	Rate
Total	230,822	345,085	66.9%	182,132	304,046	59.9%	151,125	261,836	57.7%
Men	120,780	163,710	73.8%	103,719	143,022	72.5%	95,877	123,372	77.7%
Women	110,042	181,375	60.7%	78,413	161,024	48.6%	55,248	138,464	39.9%

Sussex County

		1990			1980			1970	
	Employed	Population	Rate	Employed	Population	Rate	Employed	Population	Rate
Total	52,710	88,680	59.4%	41,933	74,504	56.3%	32,569	55,339	58.8%
Men	28,477	42,195	67.5%	24,092	35,187	68.5%	19,749	26,094	75.7%
Women	24,233	46,485	52.1%	17,841	39,317	45.4%	12,820	29,245	43.8%

Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

In Kent County, the pattern followed that of the state. Male rates were somewhat higher than those observed for the state while female rates were a bit lower. That reversed the situation that had existed in both the 1970 and 1980 labor markets. Women claimed almost 55% of the new jobs created during the period.

New Castle County had the largest gain in female labor force participation. During the period women filled almost 69% of the jobs created in New Castle County and moved from the

lowest rate in the state to the highest. Overall, New Castle County has the highest labor force participation rate in the state.

The rates observed in Sussex County were significantly different from the other two counties. First, the overall labor force participation rates increased but only slightly. Second, the observed rate for men fell during the entire period in contrast to the other counties. Third, the female rate increased but at a much slower rate than was observed elsewhere in the state. The reason for this divergent pattern undoubtedly is found in the net in-migration of older persons who have substantially lower labor force participation rates (i.e. many are retired.)

In general, the increases in the labor force participation rates for women reflect both a change in opportunity and the need for two people to work to support a family. This shift is likely to have a significant impact on the journey to work.

Workers per Household

The statement is often made that “it takes two people working today to make ends meet.” This suggests that there should have been an increase in the number of workers per household as labor force participation rates increased. This is not quite the case for one major reason.

In Figure 2-6, below, *Workers per Household* is shown in the fourth column for the period 1950-2000. The numbers have actually declined steadily over the past 40 years and only in 1990 was there a brief up tick. This data shows that workers have in fact become more dispersed through households over the period. The reason for this result is the decline in average household size from 3.5 persons per household in 1950 to 2.6 persons per household in the year 2000. One large part of that decline was the increase in single person households. Single person households can never have more than one worker per household.

The original statement still has some validity if the data is viewed in a different way. In the column labeled *Workers/Household Size* the ratio of workers per household to household size is shown. That metric declines steadily for the first twenty years and then begins to increase. In 1950, 41% of the persons in the average household were employed. By 1990 that proportion had increased to 50%.

Figure 2-6
Workers per Household
State of Delaware 1950-2000

Year	Employment	Households	Workers per Household	Workers/Household Size
1950	126,637	90,331	1.40	.40
1960	162,950	128,582	1.27	.38
1970	210,927	164,804	1.28	.39
1980	262,809	207,081	1.27	.44
1990	335,147	247,467	1.35	.50
2000	374,432	294,292	1.27	.49

Source: Center for Applied Demography and Survey Research, University of Delaware
U.S. Bureau of Census

Median Household Income

As labor force participation increases and the proportion of people in a household increases, median income should rise, other things equal. Further, income rises with age. Since Delaware is getting older it would be expected that household incomes would rise. On the other hand, the shift out of manufacturing into the service sector should act as a drag on median income, at least in the short run. All of these factors are influencing the data shown in Figure 2-7, below.

Figure 2-7
Median Household Income in Delaware
1950-1990

Year	State		Kent		New Castle		Sussex	
	Current	Constant	Current	Constant	Current	Constant	Current	Constant
1950	\$2,689	\$17,004	\$1,915	\$12,109	\$3,087	\$19,521	\$1,836	\$11,610
1960	\$5,312	\$27,349	\$3,793	\$19,528	\$5,980	\$30,788	\$4,025	\$20,723
1970	\$8,451	\$33,194	\$6,422	\$25,224	\$9,257	\$36,359	\$6,828	\$26,819
1980	\$17,846	\$33,006	\$15,342	\$28,375	\$19,656	\$36,354	\$14,483	\$26,786
1990	\$34,875	\$40,665	\$29,497	\$34,394	\$38,617	\$45,028	\$26,904	\$31,370

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

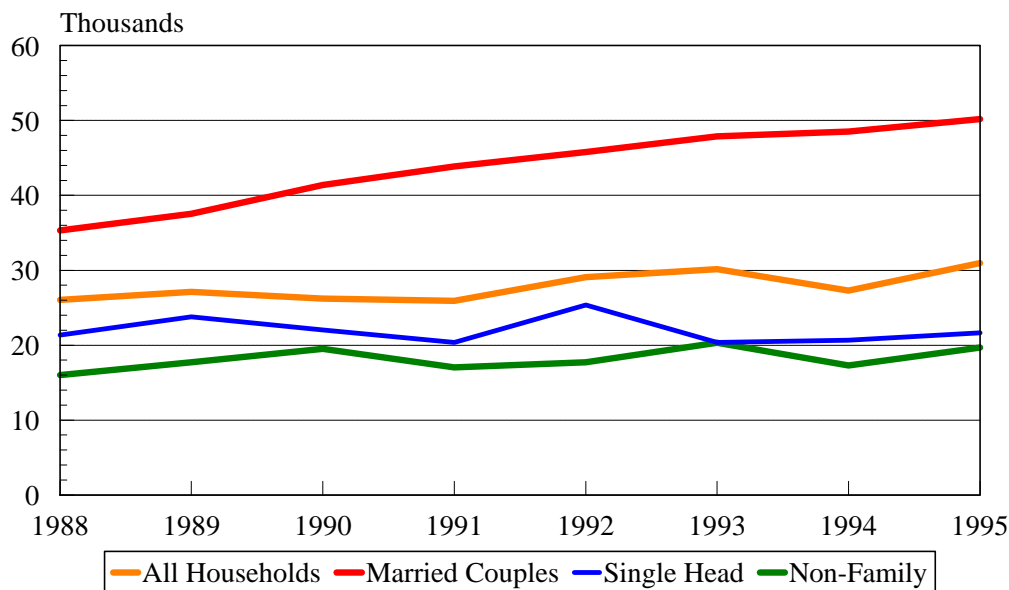
The data shown in the column labeled *Current* are in dollars of the time period unadjusted for inflation. The data under the column labeled *Constant* are all in terms of 1995 dollars and were adjusted using the CPI.

Median household incomes in constant dollars were rising steadily from 1950 to 1970. Those decades were ones of rapid economic growth in Delaware. The 1970s were another story. It was a decade of slow growth and net out-migration, at least in New Castle County. A major

recession hit the state and the country following the massive increases in oil prices. By the end of the decade the country faced major inflation and unprecedented interest rates which led into a major recession in the beginning of the 1980s. For those reasons there was no real growth in median household income with the exception of a modest increase in Kent County.

The decade of the 1980's was largely a period of major economic growth in Delaware from 1982 through 1990, with strong growth in median household income in all counties. New Castle County enjoyed the largest increase, but Kent and Sussex counties both experienced increases of nearly 20% over the decade. Part of the increase resulted from strong employment and very low unemployment rates, and part reflected the baby boomers enjoying income increases associated with their stage in the life cycle.

Figure 2-8
Median Household Income in Delaware
by Household Type
1982-1995



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census Current Population Survey, March 1988-1995

Since 1990, and the recession that followed in 1991, the record is mixed. The current dollar estimates (i.e. unadjusted for inflation,) are shown in Figure 2-8. It is important to realize that the data in this figure are from a completely different source than the decennial census and thus, are not directly comparable. However, the shapes of the graphs are indicative of the current changes in income levels.

Clearly, median household for all households fell somewhat during the 1991 recession and began to rise after that although not always in a straight line. The figure also shows, however, that not all households have benefited from the economic recovery. Both households made up of unrelated individuals (i.e. non-family households and households with a single head) have only managed to stay even in current dollars which means they have lost ground since 1990. Most of the gains, and they are substantial, have been made by husband-wife households.

Poverty

Figure 2-9, below, shows the trend in poverty within Delaware over the past twenty years. The pattern is fairly predictable given the general performance of the economy. The state experienced an overall increase in poverty during the decade of the 1970's. The increase was concentrated in New Castle County where the job picture was sufficiently negative that net out-migration occurred. Both Kent and Sussex counties reduced their poverty rates but they still remained above that of New Castle County.

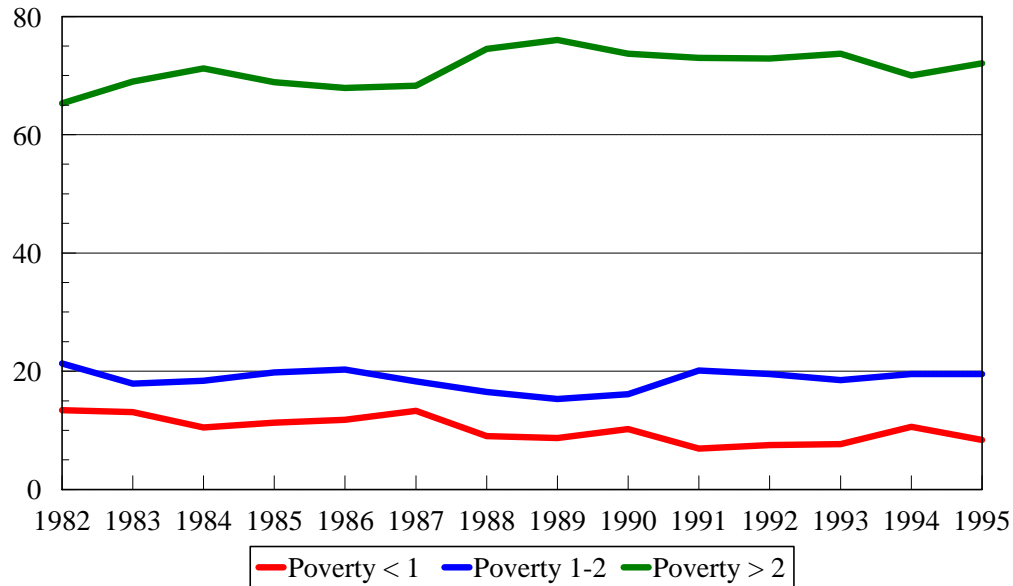
Figure 2-9
Percent of Persons in Poverty
1970-1990

Year	State	Kent	New Castle	Sussex
1970	10.9%	15.4%	9.0%	15.8%
1980	11.8%	13.6%	11.0%	13.6%
1990	8.7%	11.3%	7.5%	10.7%

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

The economic expansion of the 1980's, which generated increases in median household income, also dramatically reduced the poverty rates throughout the state, but particularly in New Castle County which enjoyed the largest increase in real income. Poverty rates in 1990 were nearly 20% lower than those observed two decades earlier.

Figure 2-10
Poverty Status of Households in Delaware
1982-1995



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census Current Population Survey, March 1982-1995

Since 1990, poverty rates have been variable. Figure 2-10 contains estimates of poverty in Delaware since 1982. In general, the rates have trended lower over the period. However, they do vary along with the level of economic activity. The most sensitive group however seems to be the near poverty group, those between poverty and 100% above the poverty line. They dropped significantly during the expansion especially from 1986 to 1989 before rising during the 1991 recession. Since that time, they have remained a constant 20% of the population. This further corroborates the claim that the latest recovery was uneven.

Trends in Commuting

Introduction

The public transportation infrastructure of Delaware, which has been bought and paid for by many generations of Delawareans, is a resource. While the infrastructure primarily is roads and bridges which fall into the Delaware's public sector, it is integrated with other resources from the private sector and those of other public bodies outside of Delaware.

This resource requires constant maintenance if it is to continue supplying services. It is also a resource that within limits can be expanded, unlike land which for the most part is considered fixed.

The transportation infrastructure is also a multi-dimensional resource that can be used in different ways. Depending on the way it is used, the capacity of the infrastructure to provide service of an acceptable quality can vary. Since the service provided is the unimpeded movement of people and goods from one place to another within the state, there are few restrictions that say *how* the infrastructure is used. People can be moved by private automobile, by bus, or by rail and any combination of those means. Those choices and combinations will have a significant impact on how the capacity of the infrastructure is consumed.

In this section, some of the choices that people are currently making will be explored. For the most part the focus will be on choices made by Delaware residents. However, where appropriate, the focal point will move from place of residence to the place of work.

Volume

Excluding summer time beach traffic and periodic holiday congestion on I-95, the capacity of infrastructure in Delaware is most utilized at "drive time," when everyone is either going to work or coming home. It is largely a peak load problem that needs to be managed in much the same way power companies are forced to manage capacity during times of peak air-conditioner use. The best indicator of past, present, or future utilization rates are the number of people who need to leave their homes and go to work.

In Figure 3-1 below, employment from 1950 to 2000 for the state and counties is displayed. There are several interesting aspects of this data. First, the annual growth rate in employment has fallen to about half of that experienced in the 1950's, from roughly 2.5% per year to 1.4% per year (1990-1996.) However, since the base has roughly tripled, the absolute growth is larger and the net effect on drive time capacity is larger.

Figure 3-1
Civilian Employment
by Place of Residence

Year	State	Kent	New Castle	Sussex
1950	126,637	15,068	87,765	23,804
1960	162,950	20,163	115,746	27,041
1970	210,927	27,233	151,125	32,569
1980	262,809	38,744	182,132	41,933
1990	335,147	51,615	230,822	52,710
2000	374,433	59,330	250,390	64,713

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

The second point is that New Castle County's share of employment has eroded, but only slightly, from 69% in 1950 to an expected 67% in 2000. This means that there will be little redistribution of peak loads from the most utilized part of the infrastructure to the less utilized part.

Figure 3-2
Percent of Delaware Civilian Population
who are Employed

Year	State	Kent	New Castle	Sussex
1950	39.8%	39.8%	40.1%	38.8%
1960	36.5%	30.7%	37.6%	33.6%
1970	38.4%	33.2%	39.1%	40.5%
1980	44.2%	39.4%	45.7%	42.7%
1990	50.3%	46.5%	52.2%	46.5%

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

The data found in Figure 3.2 suggest that there are probably other load shifts occurring. With a larger proportion of the population in the work force, there may be lower requirements for

transportation services during the typical work day. That may result in better service for those that use the roads during off-peak times and worse service for those at peak times.

Trip Length

While volume is extremely important in absorbing capacity, it is not the only variable. The number of trips must be weighted against the length of the trip. In other words, a journey of twenty miles probably uses more of the total capacity than a journey of ten miles. It almost certainly has a larger impact on the maintenance of the system quite apart from its affect on capacity.

Figure 3-3
Percent of Employed Delawareans
who Work in County of Residence

Year	State	Kent	New Castle	Sussex
1970	88.3%	90.9%	88.3%	85.6%
1980	87.6%	86.2%	89.4%	81.7%
1990	86.1%	82.4%	88.4%	79.7%

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Two somewhat crude measures of trip length are shown in Figure 3-3, above and Figure 3-4, below. They are used primarily because the time series is at least consistent. First, we see that there is a slight decrease in the proportion of people who work within their county of residence. That decrease is almost totally due to the behavior of people living in Kent or Sussex counties and working elsewhere. As will be shown later, a significant number of Kent County residents tend to work in either New Castle or Sussex counties. In contrast, a substantial number of Sussex County residents work either in Kent County or more likely, in Maryland. In either case, the trip lengths have lengthened over time.

The second measure is the median travel time to work which is found in Figure 3-4 below. Once again, there are substantial differences between the counties. Travel time in New Castle decreased slightly while Kent and Sussex experienced significant changes in opposite directions. The statewide change was negligible. The data for Kent County is consistent with a significant increase in the number of people working outside the county between 1980 and 1990. The same cannot be said for Sussex County where the two variables moved in opposite

directions. The most likely explanation is improvements in the road network that permitted faster travel. That is certainly a plausible explanation for the lack of change in New Castle County where population clearly became even more suburbanized yet trip lengths declined slightly.

Figure 3-4
Median Time Commuting to Work
for Delaware Residents
(minutes)

Year	State	Kent	New Castle	Sussex
1980	19.1	15.9	20.1	25.1
1990	19.2	17.5	19.8	18.5

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

This is also consistent with the decentralization of the employment base. In 1980, 31% of New Castle County's workers worked in Wilmington. By 1990, the absolute numbers were similar (57,000) and the proportion fell to 25%.

Trip Mode

As suburbanization continues, people will need vehicles to get around. Similarly, with a larger proportion of the population working outside the home, there will be a greater need for transportation to work. Since they need a vehicle for other purposes, that vehicle is likely to be the preferred choice for the journey to work.

Figure 3-5
Median Vehicles Available
to Delaware Households

Year	State	Kent	New Castle	Sussex
1970	1.79	1.77	1.81	1.75
1980	2.14	2.19	2.09	2.25
1990	2.24	2.26	2.22	2.34

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

As would be expected, the median number of vehicles per household has increased at roughly the same rate as the percentage of workers in the population. The rate of increase is somewhat slower in New Castle County presumably because there are alternate forms of transportation. The rate of change is much more rapid in Sussex County because it has the fewest

transportation alternatives and, with the smallest proportion of the population in the work force, is influenced by factors other than getting to work.

Figure 3-6
Percent of Delawareans Driving
to Work Alone

Year	State	Kent	New Castle	Sussex
1970	63.3%	72.6%	61.4%	62.8%
1980	67.7%	71.1%	66.2%	70.4%
1990	79.1%	79.9%	78.4%	81.3%

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Earlier in this discussion, the statement was made that the capacity of the transportation infrastructure would be influenced significantly by the way people used it. For example, two people choosing to carpool to work will reduce the resource requirement by somewhat less than half after taking into account any increase in the trip length for the pick up. If a sufficient number of people made this choice at the peak period, part of the effects of increased employment would be offset resulting in a better use of available capacity.

The trends found in Figure 3-6 above are not particularly positive with respect to capacity preservation. The proportion of people driving to work alone has increased significantly since 1970 and in most cases increased even more rapidly in the 1980's than in the prior decade. New Castle County enjoyed the smallest proportion in 1970 primarily because of the availability of transit and the location of jobs in the central business district of Wilmington. As the suburbs expanded and the employment base decentralized, the options were fewer and the likelihood that someone in your neighborhood was going the same place of work fell. Today, there is little difference between the three counties with respect to this attribute.

Fewer people, in absolute numbers, said they carpooled or walked to work in 1990 in Sussex County than reported as doing so in 1980. This behavior is consistent with stagnant or declining populations in the towns and the drift to the suburbs coupled with the type of residential development, i.e. single houses along country roads. Kent County also reported fewer people carpools and walking to work in 1990 than in 1980, but the differences were not as great. This may also reflect the more spatially centralized base of employment in Kent County.

Commuting in 1990

With the release of the Census Transportation Planning Package (CTPP) following the 1990 Census, more detailed data was made available than had ever been before. This product provided not only residence based data but also workplace based data. Both have a place in transportation analysis.

Figure 3-7
1990 Journey to Work
by Origin and Destination

Place of Work							
Place of Residence	Kent	New Castle	Sussex	Cecil	Other	At Home	Total
Kent	43,512	4,307	3,462	29	1,834	1,553	54,697
New Castle	2,028	196,960	196	2,104	22,043	4,313	227,644
Sussex	3,745	362	39,207	9	6,348	2,114	51,785
Cecil	62	10,761	69	16,018	6,872	918	34,700
Outside	1,812	29,849	4,116	3,233	n/a	n/a	39,010
Work at Home	1,553	4,313	2,114	918	n/a	n/a	8,898
Total	52,712	246,552	49,164	22,311	37,097	8,898	416,734

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Before looking at a number of variables from the CTPP, it is important to understand how this data was gathered and the most appropriate interpretation. The data was gathered in response to the question “At what location did this person work last week?” If they worked in more than one place, the one where they worked most of the time was used. This means that some people will report places where they were on business trips and you will get a wide variety of locations such as California and Europe. If the person was on vacation or ill the entire week, no information was obtained. If they only worked part of the week or part-time, the data is treated the same as a person who worked the full week and full-time. Thus, one must be careful about interpreting these data as average daily commuters.

In Figure 3-7 above, the major commuting flows, including in and out of the state, are shown. Data are shown for Cecil County, Maryland since they are part of the Metropolitan Statistical Area or MSA. The first thing to note is that the total number of people working in Delaware is 348,428. Of those 46,669 or 13% come to work in Delaware from other states. Cecil County supplies the most, 10,892, but Chester County, Pa. is a close second with 10,354 and Delaware County, PA is third with 7,556. Other prominent contributors are Salem County, NJ (3,098), Philadelphia County, PA (1,158) and Gloucester County, NJ (1,029).

Since 30,225 Delawareans are estimated to leave the state on their journey to work, there is a positive net in-migration of 16,000 workers. Those leaving the state are primarily headed to Pennsylvania with 6,188 headed for Delaware County, 3,514 for Chester County, and 4,697 for Philadelphia County. There are also 2,142 going to Cecil County, MD, 2,630 to Wicomico County, MD, and 1,716 bound for Worcester County, MD. A total of 1,724 were found on their way to Salem County, NJ.

There are also significant flows between the counties within Delaware. Kent County is a net exporter of Delaware workers since 7,769 go to work in New Castle or Sussex counties and only 5,773 come into Kent from elsewhere in Delaware. Sussex County is also a net exporter of jobs in the state, but only by about 500 and most of those go to Kent County. New Castle County attracts a net 2,445 jobs almost all of which are workers coming to New Castle County from Kent County. Overall, including internal and external sources, New Castle County is a net importer of workers and Kent and Sussex are both net exporters.

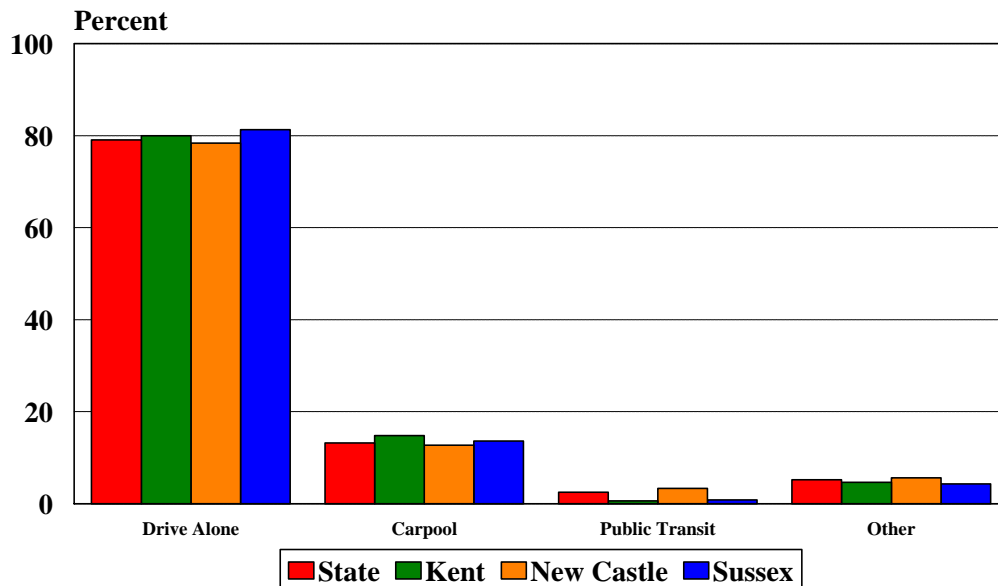
In both Figure 3-8 and Figure 3-9, below, the modes of travel used in the journey to work by resident Delawareans are displayed. The share of commuters using each mode are quite similar across the state with about 80% driving to work alone and 13% using a carpool. An additional 5% walk or ride a bicycle or motorcycle. The only variation in the distribution is the 3.3% share of transit in New Castle County, which obviously reflects the significant infrastructure of DART in New Castle County. Overall however, there are few differences to be seen in Figure 3-9, below.

Figure 3-8
Employees by Travel Mode
State of Delaware - 1990

Travel Mode	State	Percent	Kent	Percent	New Castle	Percent	Sussex	Percent
Drive Alone	258,087	79.1	42,492	80.0	175,198	78.4	40,397	81.3
Carpool	42,968	13.2	7,881	14.8	28,370	12.7	6,717	13.6
Public Transit	8,069	2.5	329	0.6	7,327	3.3	413	0.8
Other	17,022	5.2	2,442	4.6	12,436	5.6	2,144	4.3
Work at Home	7,980		1,553		4,313		2,114	

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Figure 3-9
Percent of Employees by Travel Mode
State of Delaware - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

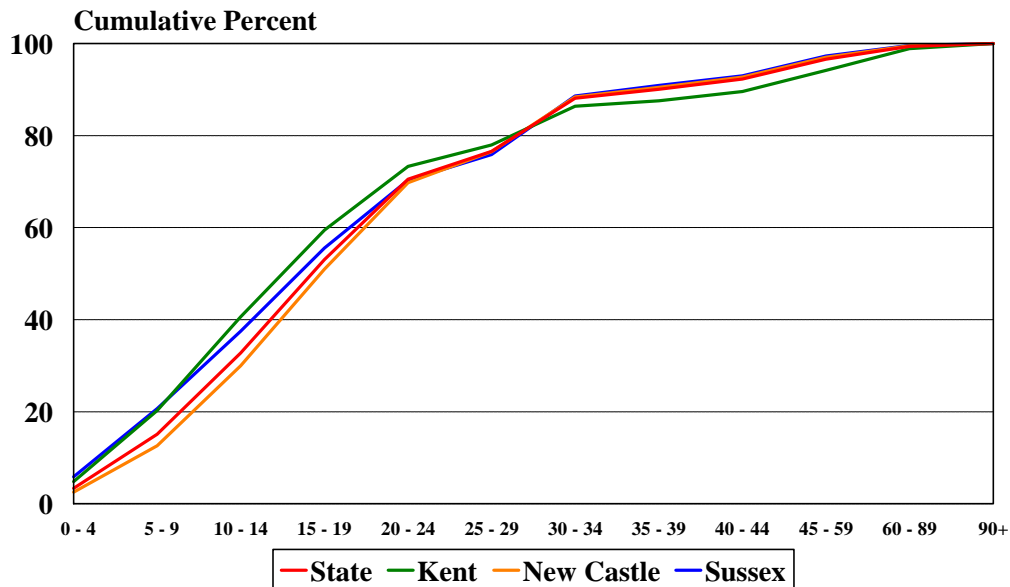
In an earlier section, the median travel time to work was shown to be around 20 minutes. The full distribution is shown in Figure 3-10 and Figure 3-11 below. More than 53% of Delaware workers spend less than 20 minutes getting to work and 15% take less than 10 minutes to reach their work location. The largest single group of commuters (65,976) is concentrated in the 15 to 19.9 minute trip length class. Less than a quarter of all workers spend more than 30 minutes reaching their employer's place of business and only 3% take an hour or more. The bottom line is that the time it takes to get to work in Delaware is modest in comparison with some places in the country and Delawareans take slightly less time than the average of all workers in the US.

Figure 3-10
Employees by Travel Time to Work in Minutes:
State of Delaware - 1990

Travel Time	State	Percent	Kent	Percent	New Castle	Percent	Sussex	Percent
0 - 4	10,975	3.4	2,558	4.8	5,492	2.5	2,925	5.9
5 - 9	38,130	15.1	8,227	20.3	22,547	12.6	7,356	20.7
10 - 14	58,000	32.8	10,778	40.6	38,881	30.0	8,341	37.5
15 - 19	65,976	53.1	10,058	59.5	46,916	51.0	9,002	55.6
20 - 24	56,710	70.5	7,355	73.3	42,047	69.8	7,308	70.3
25 - 29	20,156	76.6	2,475	78.0	14,922	76.5	2,759	75.9
30 - 34	37,328	88.1	4,440	86.4	26,546	88.4	6,342	88.6
35 - 39	6,511	90.1	684	87.6	4,728	90.5	1,099	90.9
40 - 44	7,135	92.3	1,049	89.6	5,048	92.7	1,038	93.0
45 - 59	14,033	96.6	2,420	94.2	9,431	97.0	2,182	97.3
60 - 89	9,355	99.4	2,526	98.9	5,720	99.5	1,109	99.6
90+	1,837	100.0	574	100.0	1,053	100.0	210	100.0
Work at Home	7,980		1,553		4,313		2,114	

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Figure 3-11
Distribution of Employees by Travel Time to Work in Minutes:
State of Delaware - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

There are some differences between the counties and these are best seen in the graph found in Figure 3-11 below. This is a cumulative distribution so the graph rises from 0 to 100% as travel times are increased. For example, the graph shows that approximately 60% of Kent County residents take 20 minutes or less to get to work. On the graph, that 60% is associated with the 15-

19.99 minute group and all those trips that are shorter. The fact that the New Castle County line on the graph is below the others indicates that those residents are experiencing longer trips. From Figure 3-10 above, it is clear that fewer people in New Castle County are in the very short time lengths. While 20% of workers in both Kent and Sussex counties spend less than 10 minutes getting to work, only 12.6% spend that little in New Castle County. The net effect is that the graph falls below those for the lower Delaware.

Figure 3-12
Employees by Time Leaving Home for Work:
State of Delaware - 1990

Time	State	Percent	Kent	Percent	New Castle	Percent	Sussex	Percent
12:00am - 4:59am	6,745	2.1	1,532	2.9	3,750	1.7	1,463	3.0
5:00am - 5:29am	5,820	1.8	1,274	2.4	3,481	1.5	1,065	2.1
5:30am - 5:59am	9,099	2.8	1,728	3.2	5,966	2.7	1,405	2.8
6:00am - 6:29am	22,829	7.0	3,602	6.8	15,190	6.8	4,037	8.1
6:30am - 6:59am	38,303	11.7	5,729	10.8	26,597	11.9	5,977	12.0
7:00am - 7:29am	62,020	19	9,409	17.7	44,186	19.8	8,425	17.0
7:30am - 7:59am	57,357	17.6	10,025	18.9	38,476	17.2	8,856	17.8
8:00am - 8:29am	38,001	11.7	5,401	10.2	26,896	12.1	5,704	11.5
8:30am - 8:59am	17,127	5.2	2,369	4.4	12,020	5.4	2,738	5.5
9:00am - 9:59am	15,618	4.8	2,409	4.5	10,759	4.8	2,450	4.9
10:00am - 10:59am	5,967	1.8	965	1.8	4,102	1.8	900	1.8
11:00am - 11:59am	3,035	0.9	463	0.9	2,192	1.0	380	0.8
12:00pm - 3:59pm	22,097	6.8	4,181	7.9	15,015	6.7	2,901	5.9
4:00pm - 11:59pm	22,128	6.8	4,057	7.6	14,701	6.6	3,370	6.8

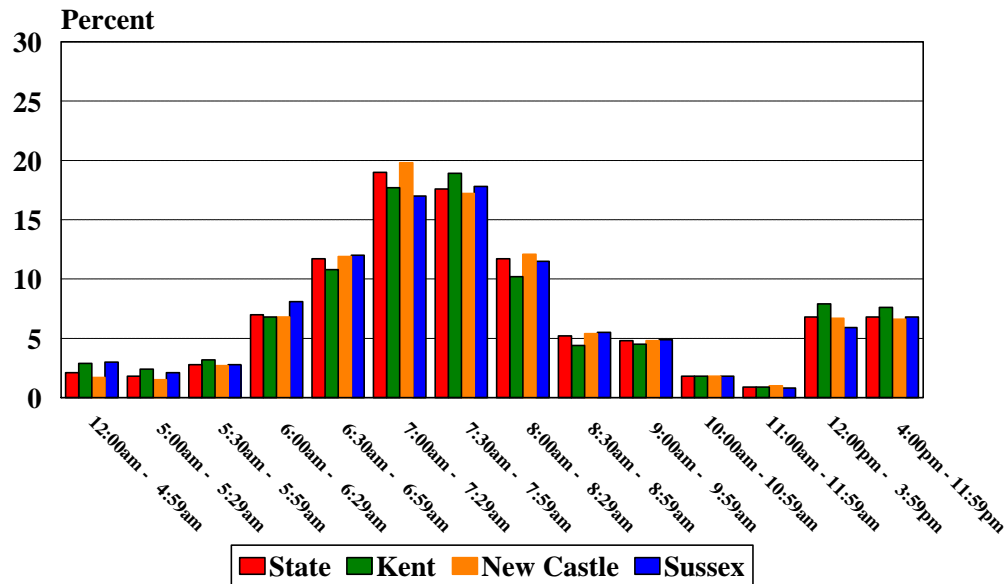
Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

Delaware workers are fairly conventional in their journey to work in that 60% of them leave for work in the typical drive time beginning at 6:30am and ending at 8:30am. The numbers drop off significantly both before and after that period. The single largest group (62,020) hits the road between 7 and 7:30am. It also appears from Figure 3-12 above that only between 10% and 15% of all workers are night workers.

The distribution of departure times across the counties is similar. This can be seen in Figure 3-13 below. There are, however, some small differences that are worth noting. First, Kent and Sussex county residents are a bit more likely to go to work in the early morning. Second, Kent County seems to have a higher percentage of evening workers. Third, for those with conventional start times, it appears that those in New Castle County leave home about a half an hour earlier. The largest group is concentrated in the 7-7:30am block in New Castle County and

the largest groups are in the 7:30-8am block in Kent and Sussex counties. This is consistent with the somewhat longer journey to work in New Castle County noticed earlier.

Figure 3-13
Percent of Employees by Time Leaving Home for Work:
State of Delaware - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

It also may be useful to see the differences in travel time and earnings associated with the different travel modes. The first attribute tells us something about the time cost differentials between modes while the second may suggest something about different preferences.

Figure 3-14
Average Travel Time in Minutes by Travel Mode:
State of Delaware - 1990

Travel Mode	State	Kent	New Castle	Sussex
Drive Alone	19.7	19.4	20.0	18.5
Carpool	22.7	23.7	22.3	23.1
Public Transit	30.4	31.4	30.2	33.8
Other	12.4	11.7	12.9	10.4
All Modes	20.0	19.7	20.3	18.9

Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

In Figure 3-14 above, journey to work travel times are shown by mode of travel. Predictably, the “Other” category is the shortest because it includes the walkers and the

bicyclists. The second lowest category, “drive alone”, which includes 80% of all workers is the de facto standard against which others are measured and it averages 19.7 minutes. Carpools follow fairly close behind with a 15% increase in time to 22.7 minutes. Since 80% of all carpooling workers are in carpools of 2 persons, the time difference of three minutes is probably reasonable. Public transit in contrast adds an additional ten minutes to the journey for an average time of 40.4 minutes. That amounts to a 50% increase over driving alone. Since transit riders are not distributed in the same manner as private vehicle occupants, that estimate is definitely on the low side. Finally, all of the patterns seen statewide hold for the counties.

Figure 3-15
Average Earnings by Travel Mode:
State of Delaware - 1990

Travel Mode	State	Kent	New Castle	Sussex
Drive Alone	\$26,351	\$21,497	\$28,771	\$20,969
Carpool	\$21,870	\$16,778	\$24,040	\$18,684
Public Transit	\$20,802	\$12,393	\$21,518	\$13,553
Other	\$15,500	\$14,075	\$15,878	\$14,961
Work at Home	\$18,743	\$17,626	\$19,576	\$17,870
All Modes	\$24,945	\$20,454	\$27,085	\$20,287

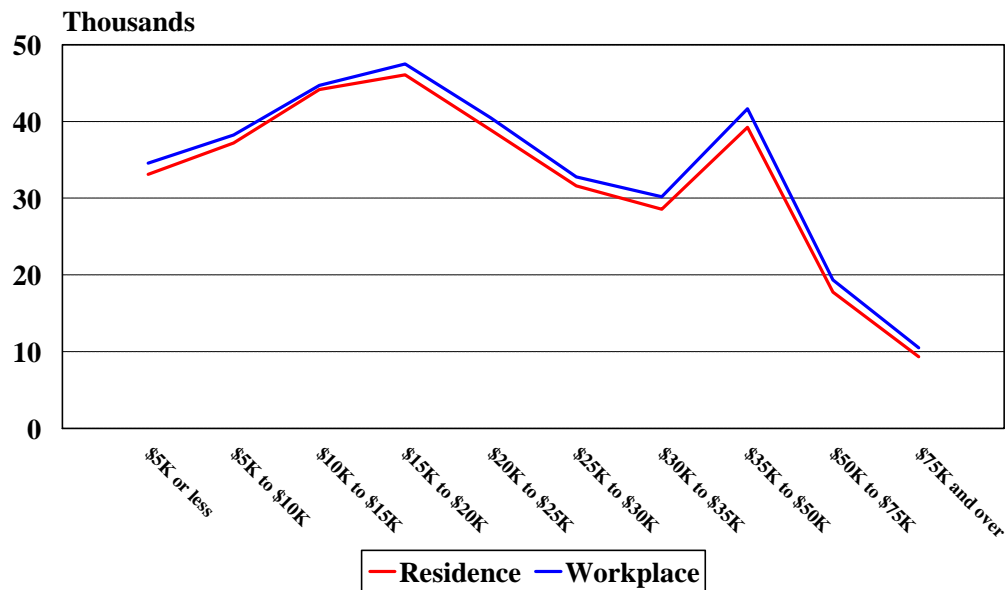
Source: Center for Applied Demography and Survey Research, University of Delaware
US Bureau of Census

The data contained in Figure 3-15 reflect annual earnings for an individual. They are not to be confused with household incomes which will include wages of multiple people and non-wage income. This information is consistent with the notion that income plays a role in the choice of travel mode. The “drive alone” workers have significantly higher incomes than those in the other categories. Statewide, their wages are 20% higher than the next highest group. The fact that the earnings of those in carpools are lower suggests that there is a strong economic incentive as well as one of convenience at work here. Public transit users have lower earnings than those in carpools however the difference overall is not that large. This may indicate that transit and carpools are effective substitutes for that part of the worker population that has access to both.

Finally, questions are inevitably raised as to what the effects are of all of this commuting. One of the most frequent questions is how commuting affects income levels in the state. The answer to this question is found, if indirectly, in Figure 3-16, below. The two lines show the number of workers at each income level by place of work and place of residence. Since more people work in Delaware than work and live in Delaware, the workplace line will always be above the line for residence. The most important feature of the figure is that the two graphs

are essentially parallel. This means that those who come into the state to work and those that live here and work outside the state are distributed similarly across the income distribution. If, for example, more high income workers commuted into Delaware than commuted in the opposite direction, a wider gap would be expected between the two lines.

Figure 3-16
Employment within Earnings Categories
by Place of Residence and Place of Work
State of Delaware - 1990

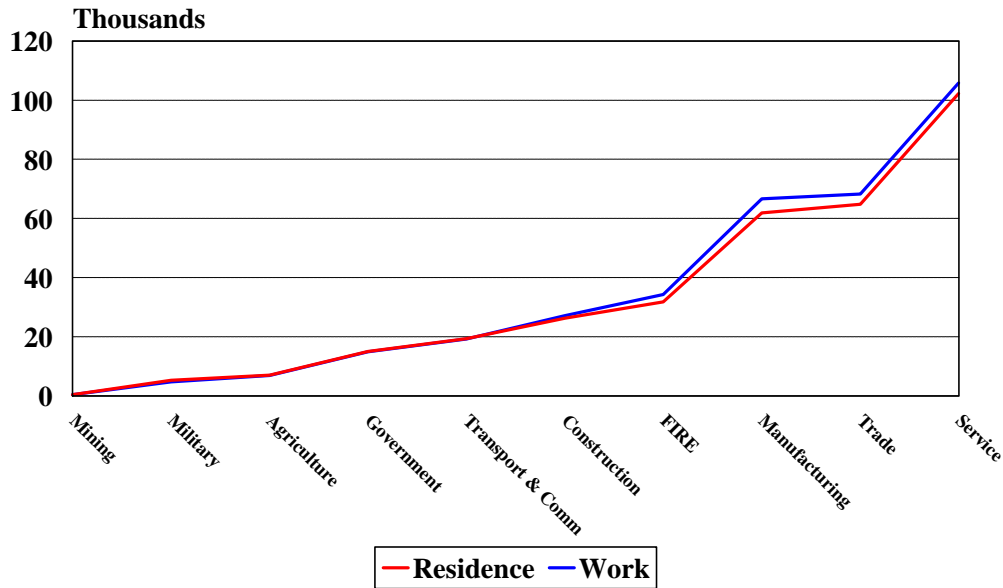


Source: Center for Applied Demography and Survey Research, University of Delaware
 US Bureau of Census

There are, however, two places where the distributions are a bit different. At \$10,000, there is very little difference in the two lines. This suggests that the number of in-commuters almost offsets the number of out-commuters. The opposite is true at \$35,000 where the gap grows wider showing relatively more in-commuters than out-commuters at that income level. Overall the distributions are quite similar.

Questions are often asked about the sectors that are attracting commuters across Delaware's borders and what occupations are the most in demand. These issues are addressed in Figures 3-17 and 3-18, below.

Figure 3-17
Employment within Industry
by Place of Residence and Place of Work:
State of Delaware - 1990

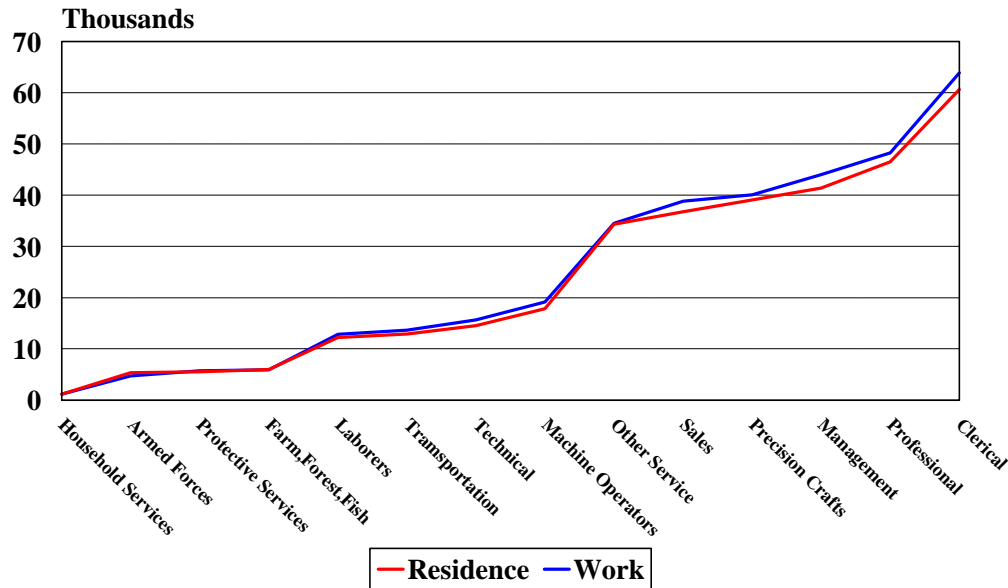


Source: Center for Applied Demography and Survey Research, University of Delaware
 US Bureau of Census

For those sectors with less than 30,000 employed, there are only small differences between in and out commuting. The two lines representing employment by place of residence and place of work almost coincide. The four largest sectors, including FIRE (finance, insurance, and real estate), Manufacturing, Trade (wholesale plus retail), and the Service industry all have net in-commuting. Of those, Manufacturing has the largest absolute number of net-commuters. If the earlier discussion on the impact of commuting on earnings had not shown a relatively stable pattern, it would have been reasonable to expect negligible net commuting in Trade and Service. This is not the case. Apparently, the relatively lower earnings in those sectors are not deterrents to commuting.

The effect of net commuting on the structure of occupations is consistent with the findings for both earnings and industry, Figure 3-18. Managers lead the way for net in-commuting. Many of these are likely to be in the manufacturing sector given the larger size of firms in that sector. Clerical workers enter Delaware in similar numbers (net) with many working in both manufacturing and the service sector. Net in-commuting in the trade sector is also consistent with net in-commuting of sales personnel.

Figure 3-18
Employment within Occupation
by Place of Residence and Place of Work:
State of Delaware - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware
 US Bureau of Census

Overall, net in-commuting appears to have a benign impact on the state. There is an impact at “drive time” since most of these commuters are in their automobiles. On the other hand they are not making off-peak trips and they pay Delaware income taxes without receiving many of the state’s services. It is also likely that many of the workers in the Trade sector are servicing out-of-state shoppers who are avoiding their state sales tax. That activity has an impact on traffic but it also has a positive influence on the state’s economy.

OBSERVATIONS

The trends outlined in these pages have a number of implications for transportation in the state during the next thirty years. A few of these are offered below with the caveat that economic conditions and public policies always have the opportunity to alter these observations to some degree.

- The increasing number of adults in the population will generate significant new needs for “drive time” transportation capacity.
- Declining household size will ensure that household formation will rise faster than population and put substantial pressure on new housing construction. The increasing number of single person households will tend to choose single family detached housing influenced primarily by tax benefits.
- Net in-migration will also significantly increase the need for additional housing units. The age structure of those in-migrants will also make them lean toward single family detached housing. Without a change in the home mortgage interest deduction, this behavior is unlikely to change.
- There is likely to be some upward pressure on multi-unit housing as the baby boomlet reaches the household formation age which will reverse a decade long slide. On the other hand, that need may also add to the boom in mobile homes, particularly in Kent and Sussex counties.
- With the baby boomers in the high earnings stage of their life cycle, they will be less likely to be influenced by the costs of owning a car and should even be less sensitive to increases in gasoline taxes and other costs of transportation.
- As the baby boomers age, the need for public transportation will very likely increase. This will be heavily influenced by the health and financial condition of the boomers.
- Firms are likely to be smaller, more diverse, and less concentrated spatially within the state. This will continue to make it difficult to operate a competitive alternative to the private automobile. This suggests that peak loads are more likely to be reduced by firms altering work hours and/or promoting carpooling.
- With fewer workers per household and an increasing portion of the work force working multiple jobs and more part-time jobs, work trips should rise and the average vehicle occupancy should fall. On the other hand, many part-time jobs may be off-peak and fewer non-work trips will be generated as people increase their participation rates.

- As the baby boomers begin to retire, many more will have to seek employment if only on a part-time basis. While this will generate more work trips, there should be a reduction in non-work trips.
- If incomes in Delaware continue to rise and poverty continues to fall, there will be a tendency for even more people to turn from transit to their private vehicles. In other words, given a choice more people choose what they see as the most efficient and convenient means of travel. On the other hand, the opposite is true, lower incomes lead to more ride-sharing and use of public transportation, if it is available.
- Average trip lengths to work are unlikely to increase dramatically as people look for housing within a 20 minute commute to work. Thus, as employment continues to fan out, so will housing. Given that Delawareans are far from the commuting times of the New York or Washington area, it is difficult to see how even modest increases in commute time or congestion will affect the spatial dimension of the housing choice.
- The total number of people using public transit in their journey to work will rise over time, but transit's share of the market will probably shrink. The current transit market is dominated by the journey to Wilmington and whose share of total employment continues to decline. In addition, most of the new housing will be built below US 40 and those residents are more likely to be employed south and west of Wilmington.

APPENDIX

Supplemental Maps

Figure A-1

**Percent Driving to Work Alone
by County of Residence - 1990**

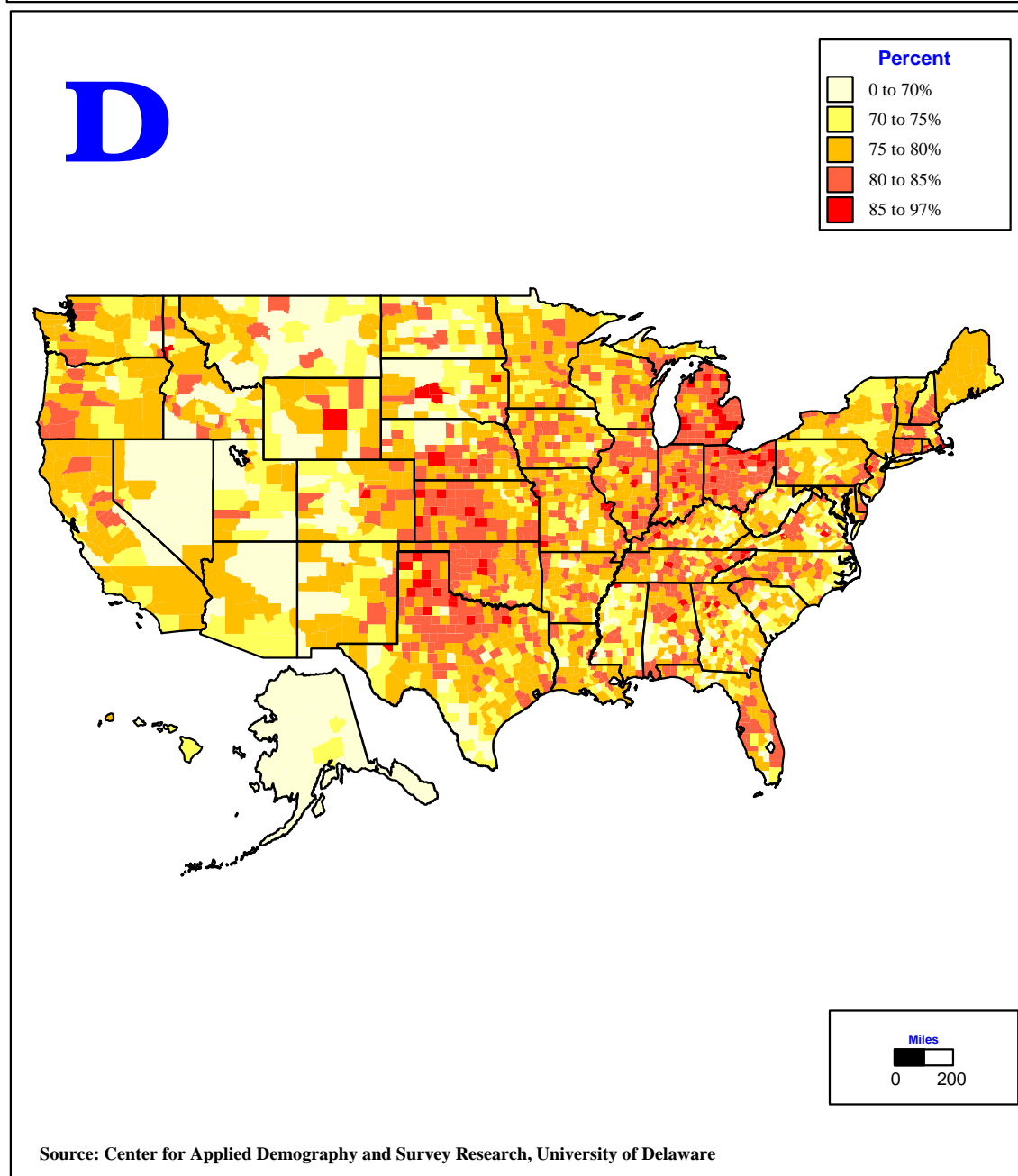


Figure A-2
Percent Carpooling to Work
by County of Residence - 1990

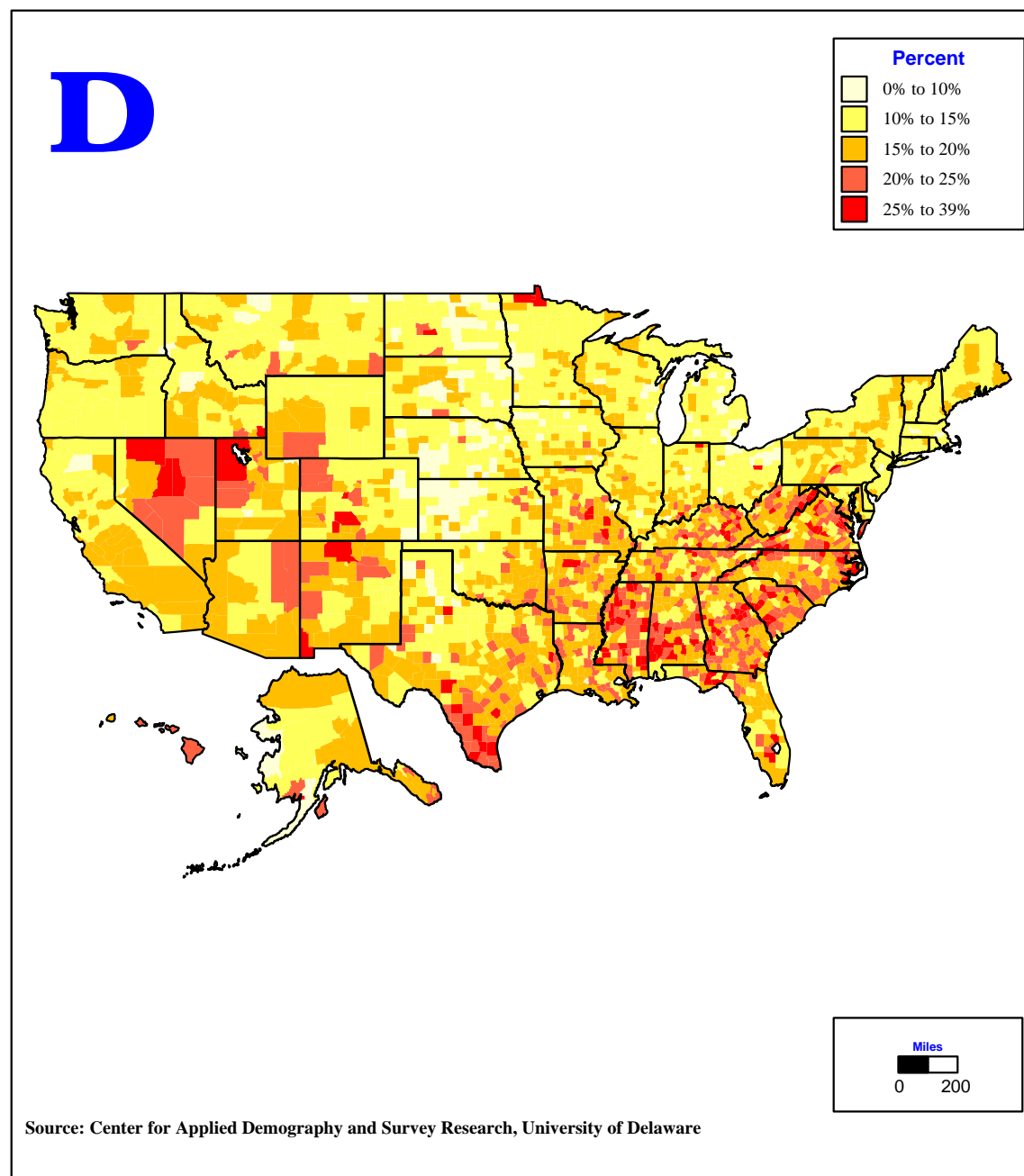


Figure A-3
Percent Taking Public Transportation to Work
by County of Residence - 1990

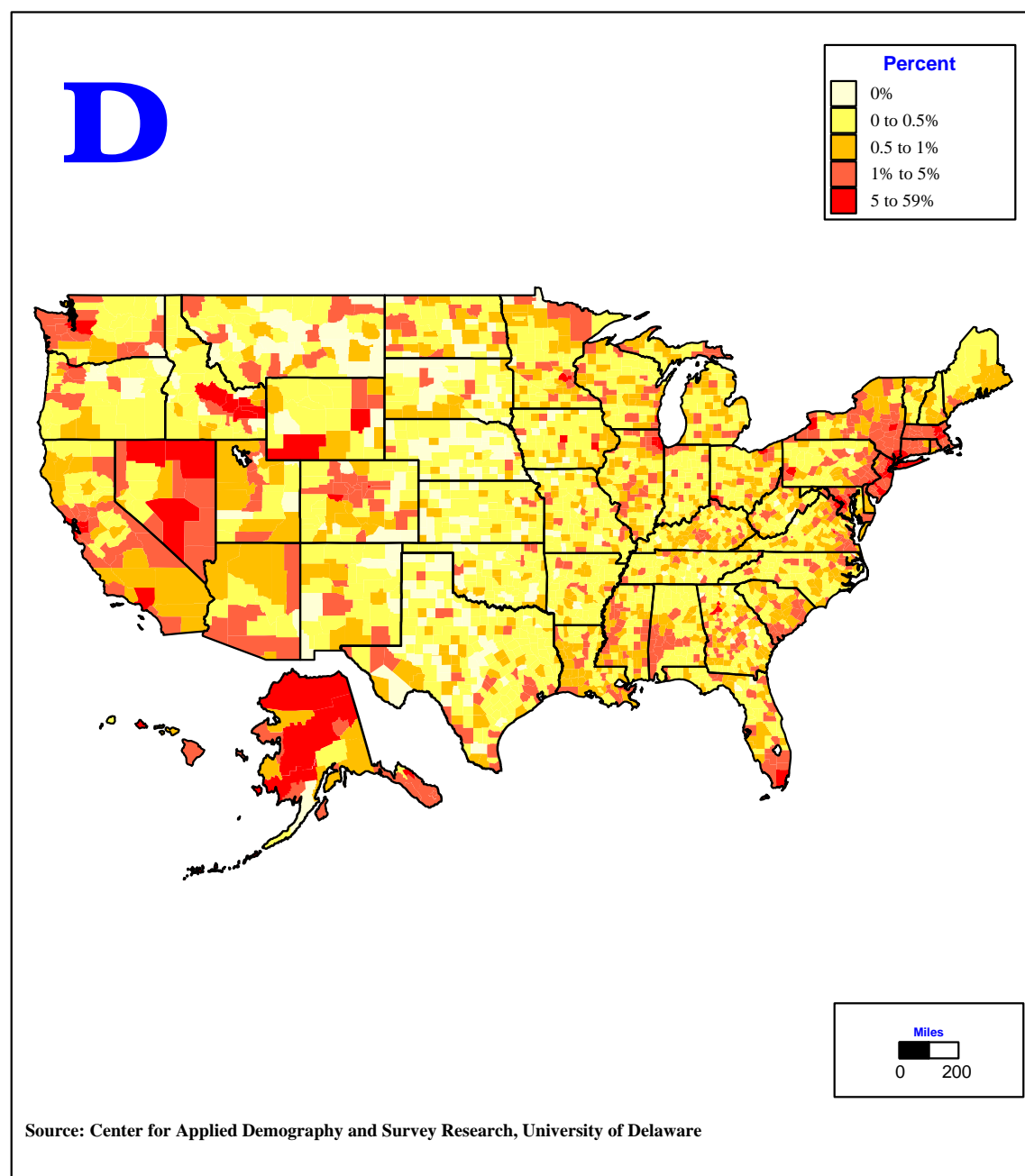
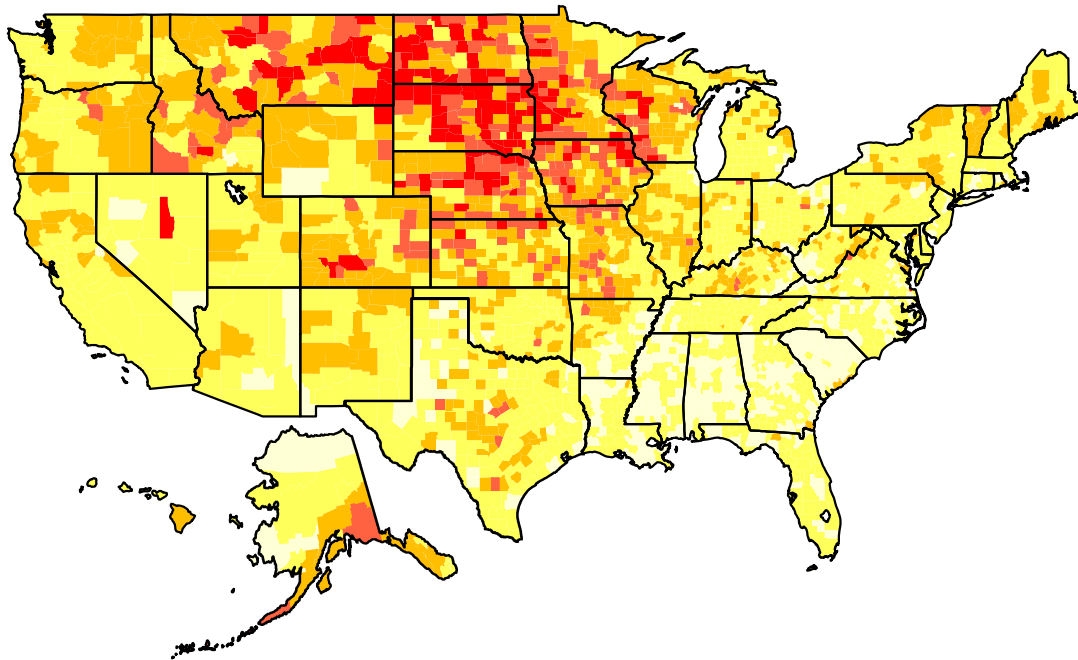


Figure A-4

**Percent Working at Home
by County of Residence - 1990**

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Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-5

**Average Travel Time to Work
by County of Residence - 1990**

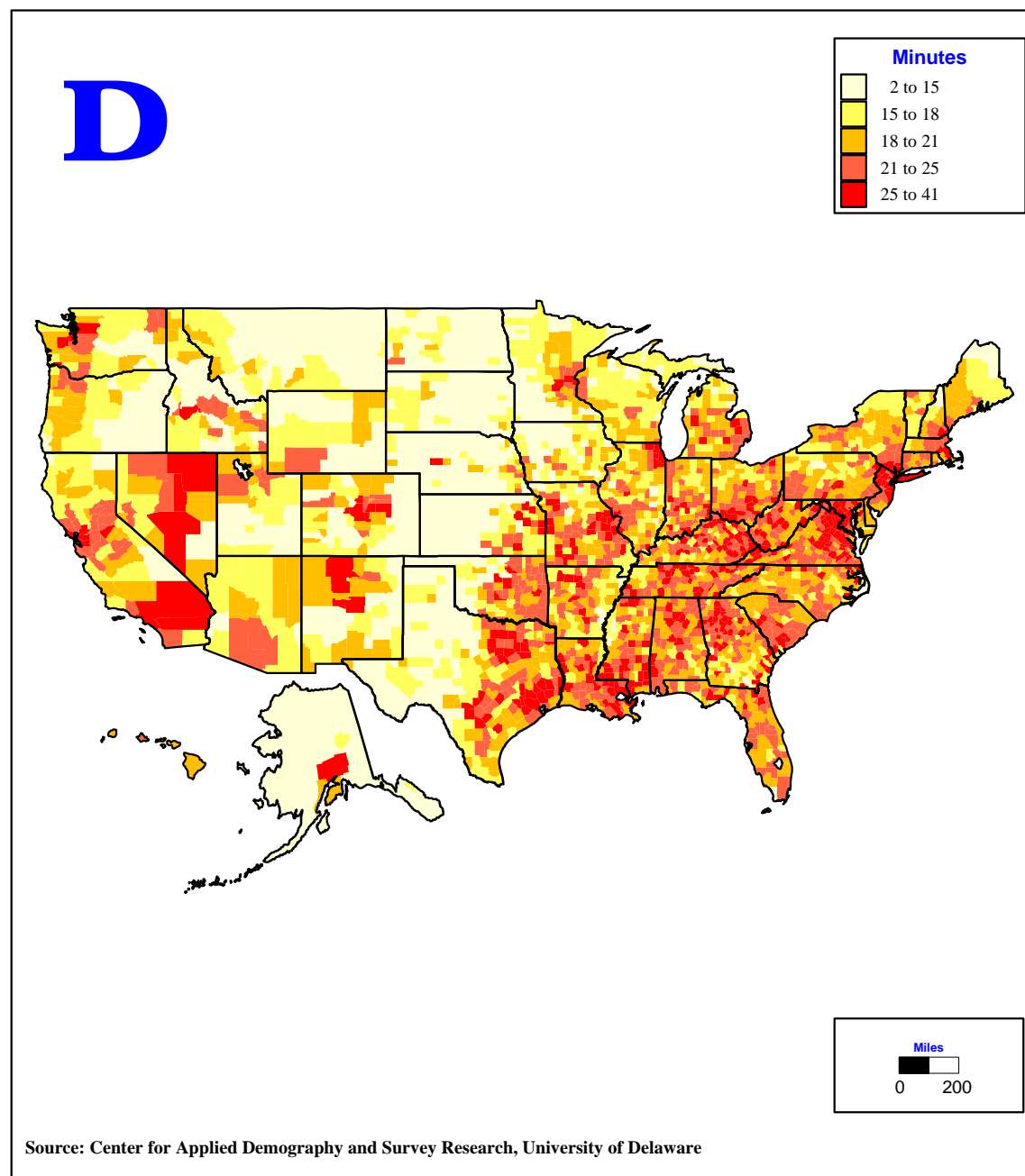
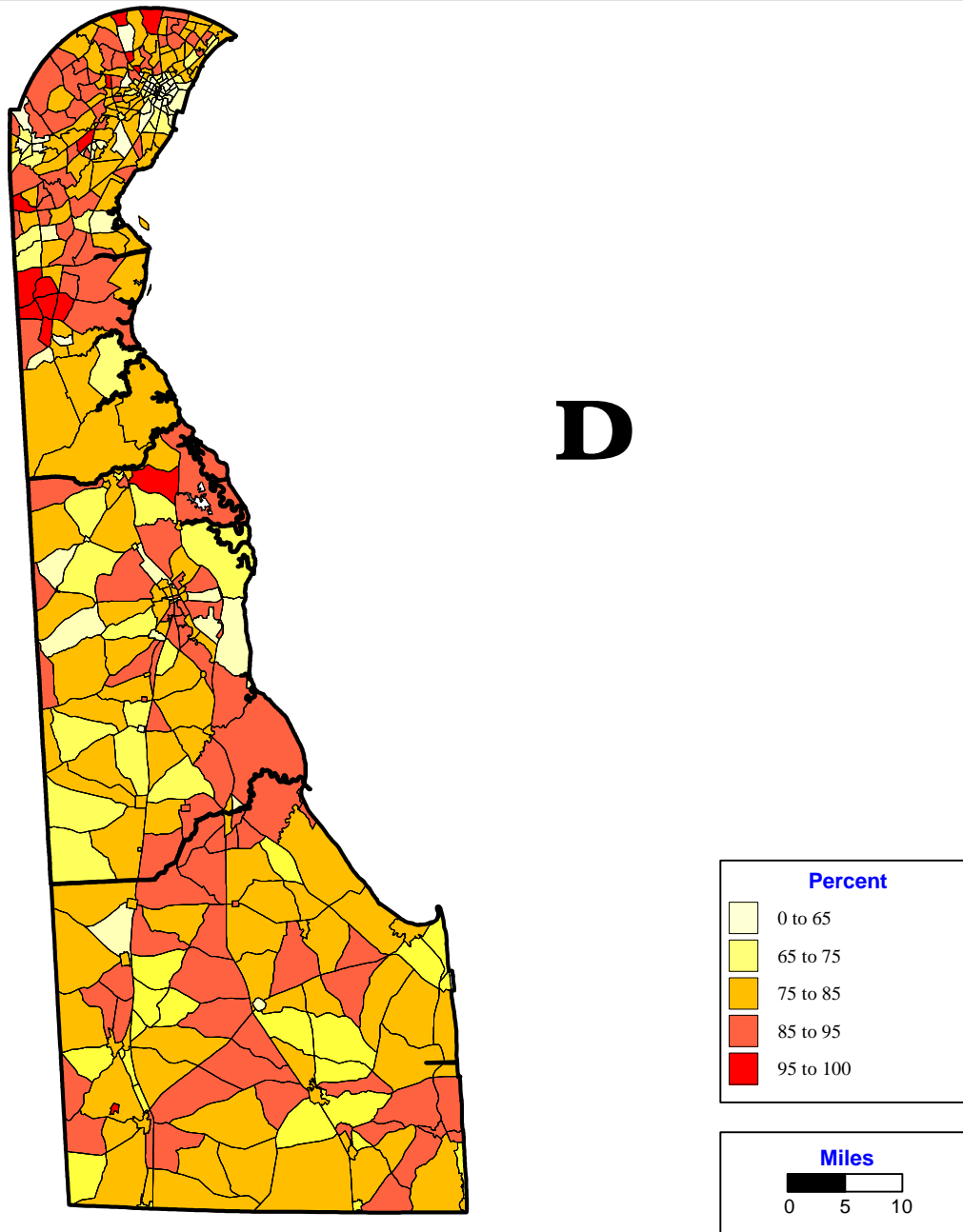


Figure A-6
Percent Driving to Work Alone
by Traffic Zone of Residence in Delaware - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-7
Percent Carpooling to Work
by Traffic Zone of Residence in Delaware - 1990

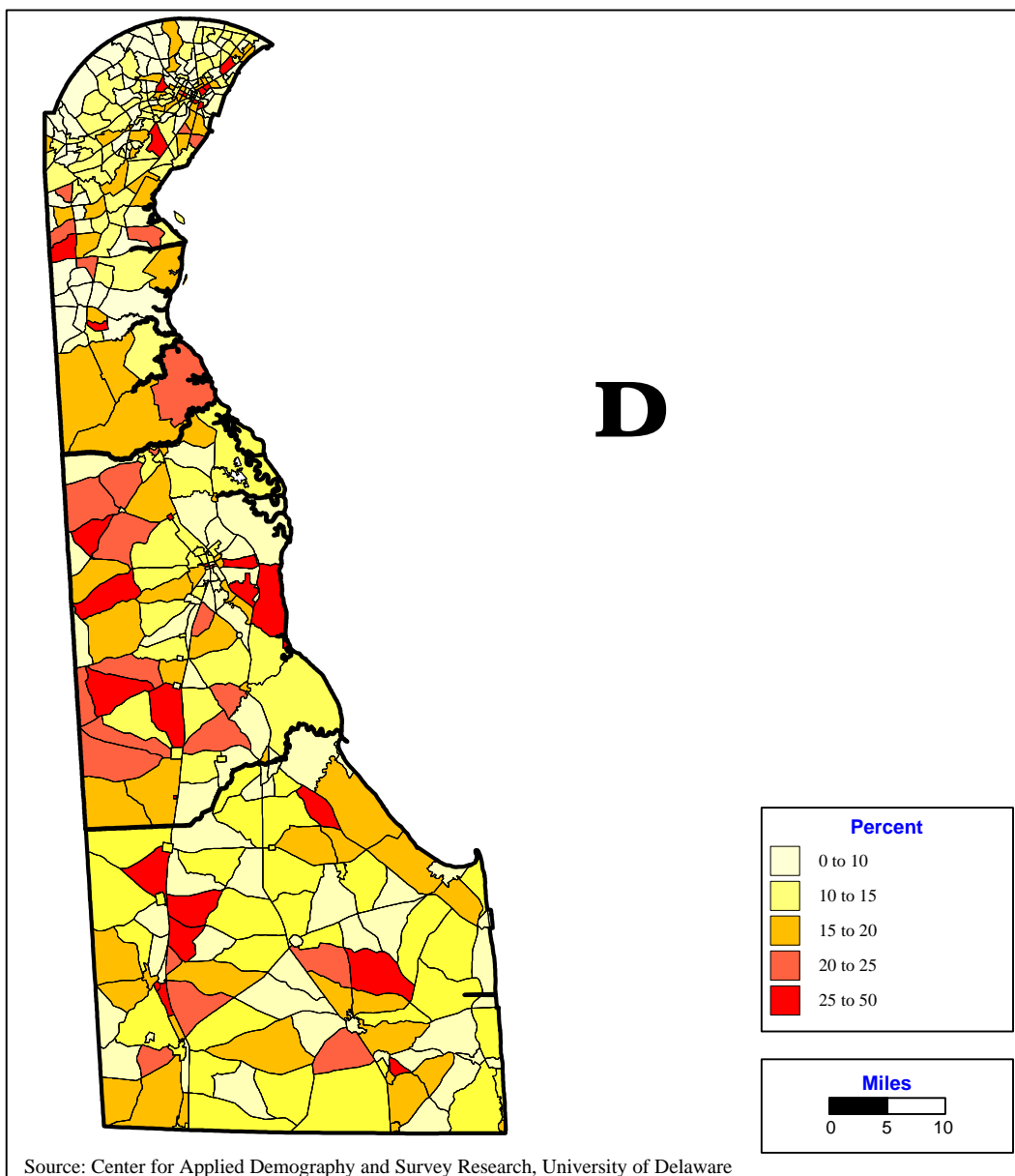


Figure A-8
Percent Taking Public Transit to Work
by Traffic Zone of Residence in Delaware - 1990

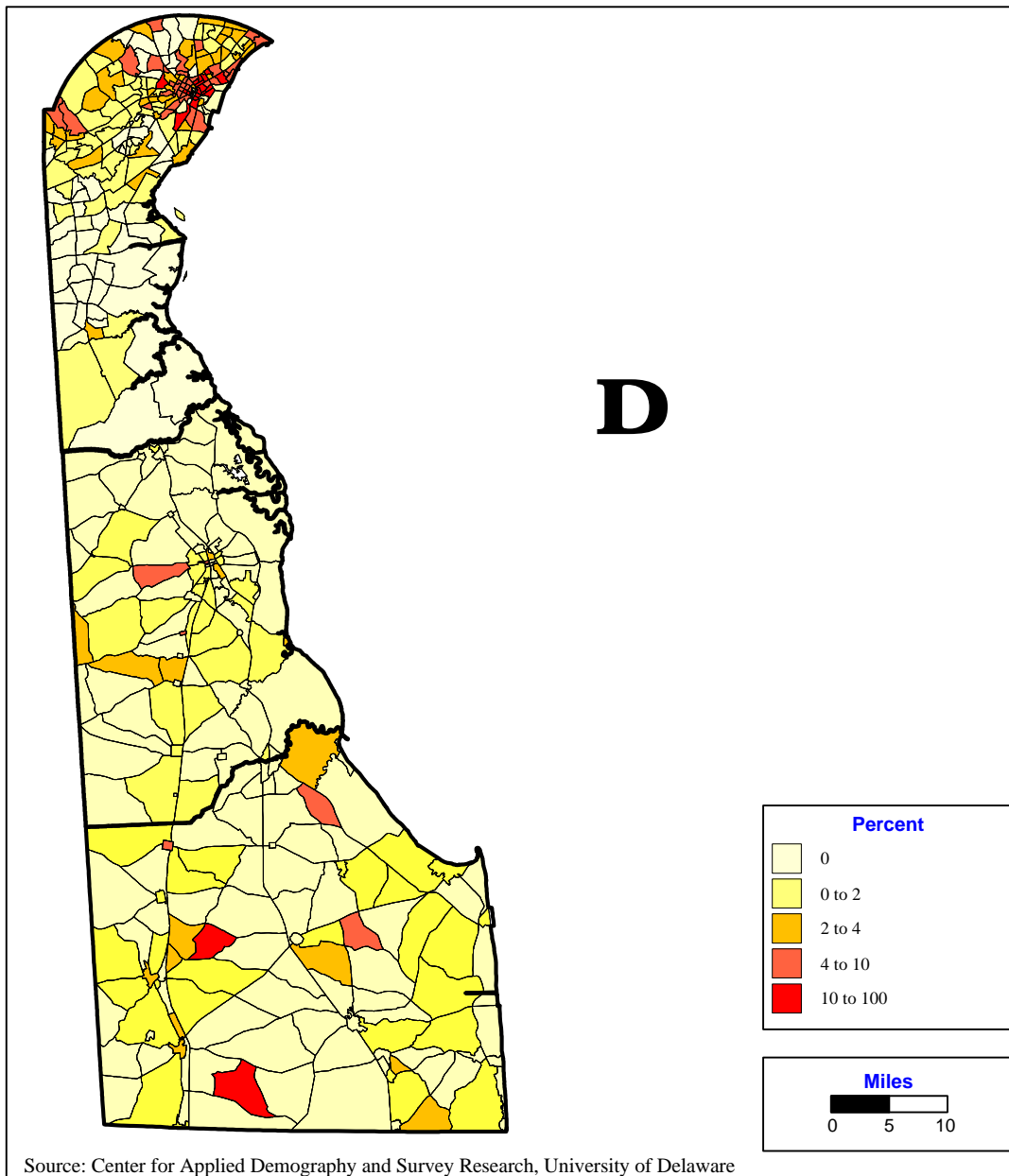
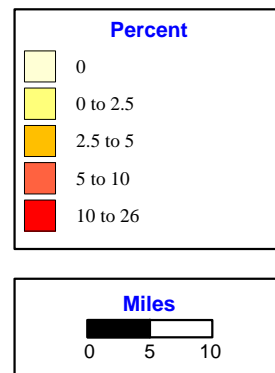
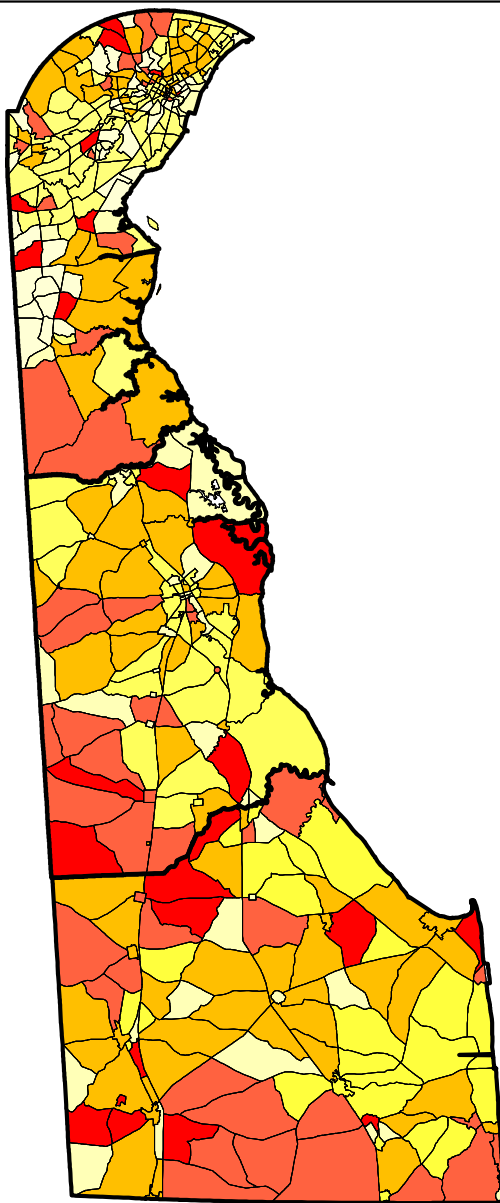
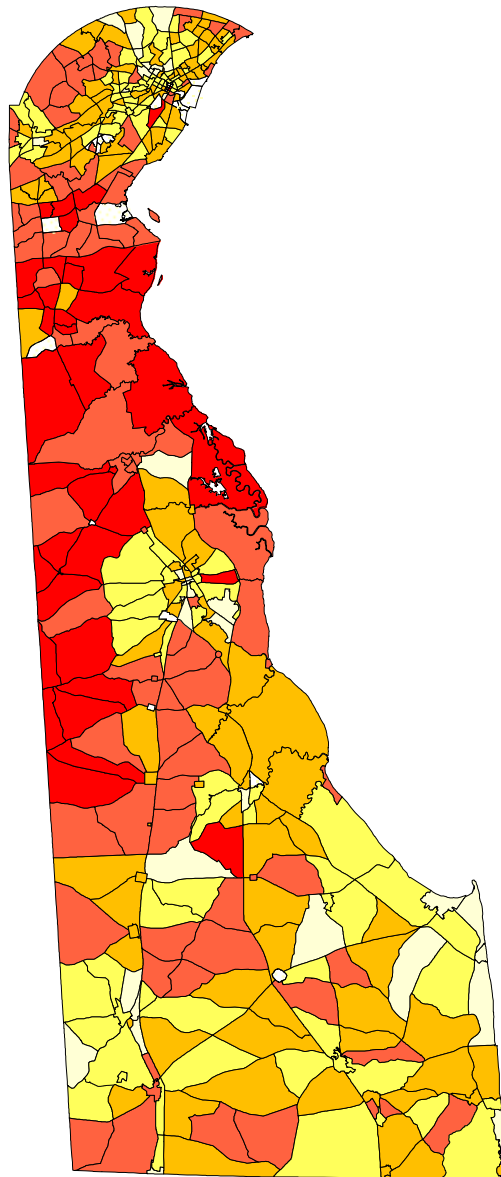


Figure A-9
Percent Working at Home
by Traffic Zone of Residence in Delaware - 1990



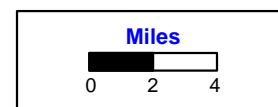
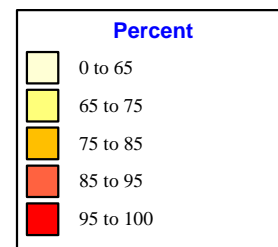
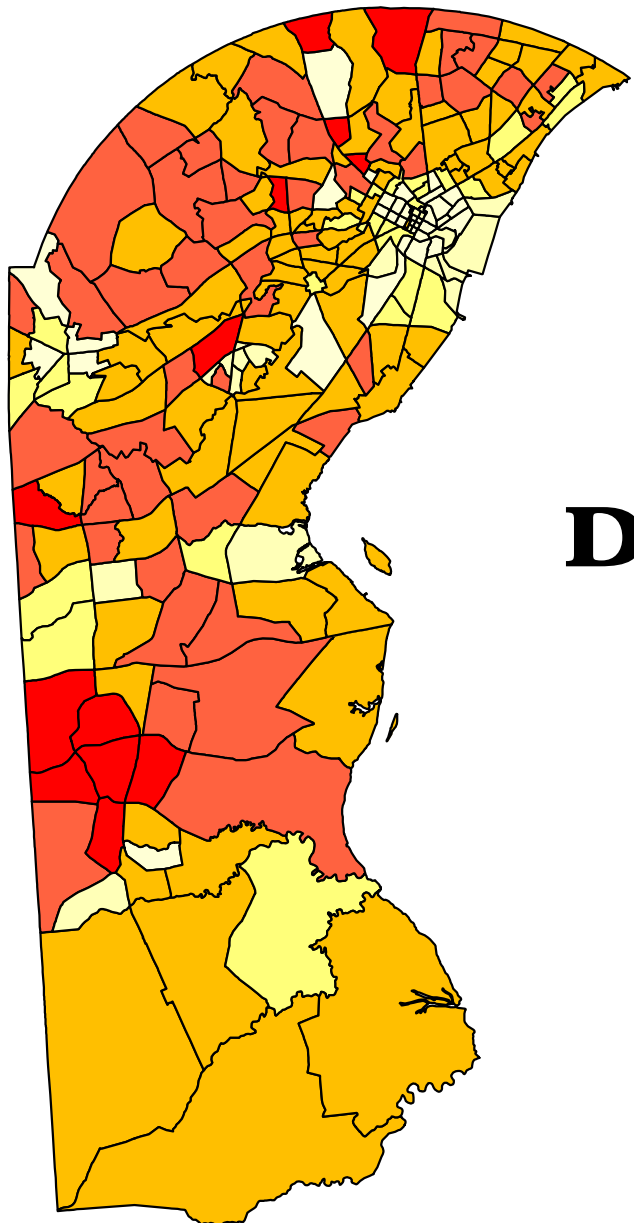
Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-10
Average Travel Time to Work
by Traffic Zone of Residence in Delaware - 1990



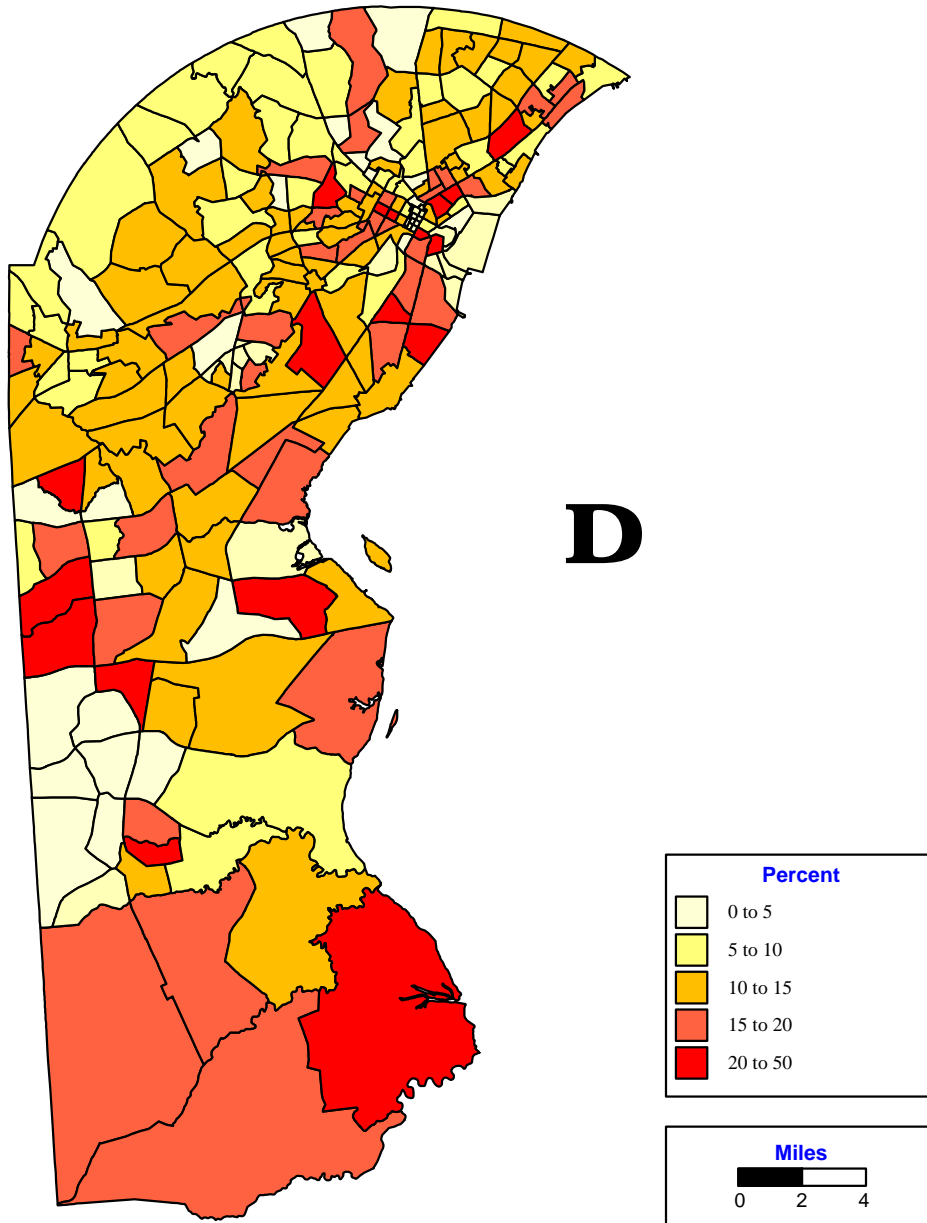
Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-11
Percent Driving to Work Alone
by Traffic Zone of Residence in New Castle County, DE - 1990



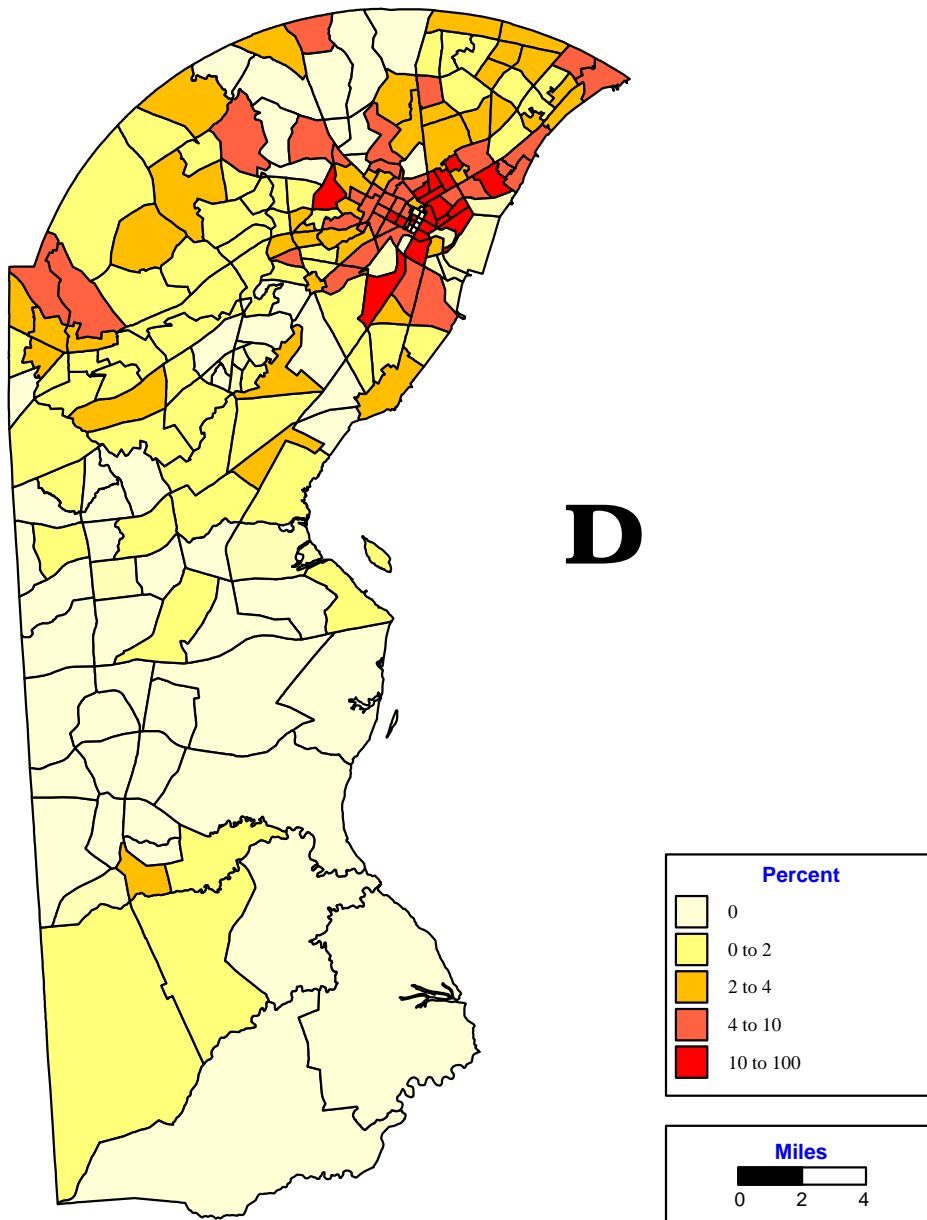
Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-12
Percent Carpooling to Work
by Traffic Zone of Residence in New Castle County, DE - 1990



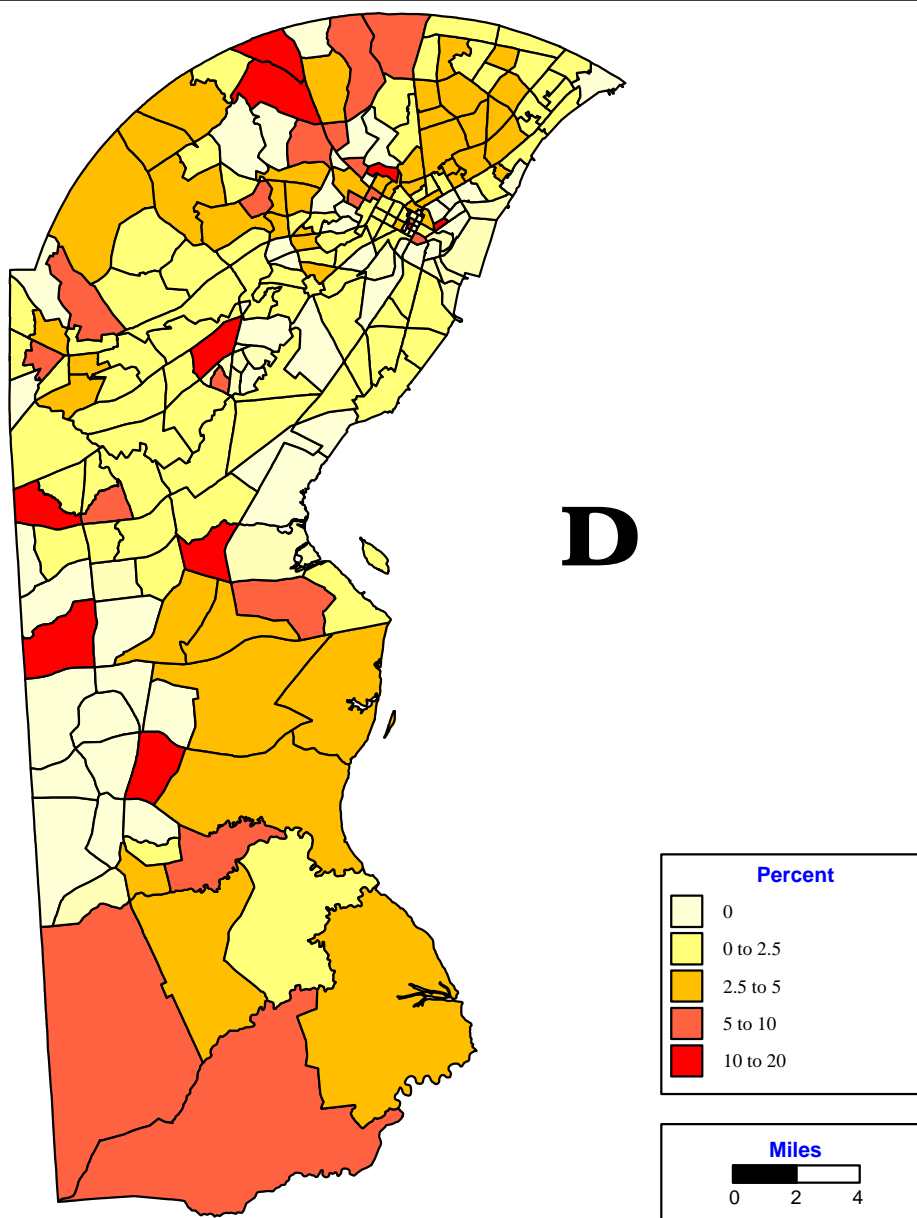
Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-13
Percent Taking Public Transportation to Work
by Traffic Zone of Residence in New Castle County, DE - 1990



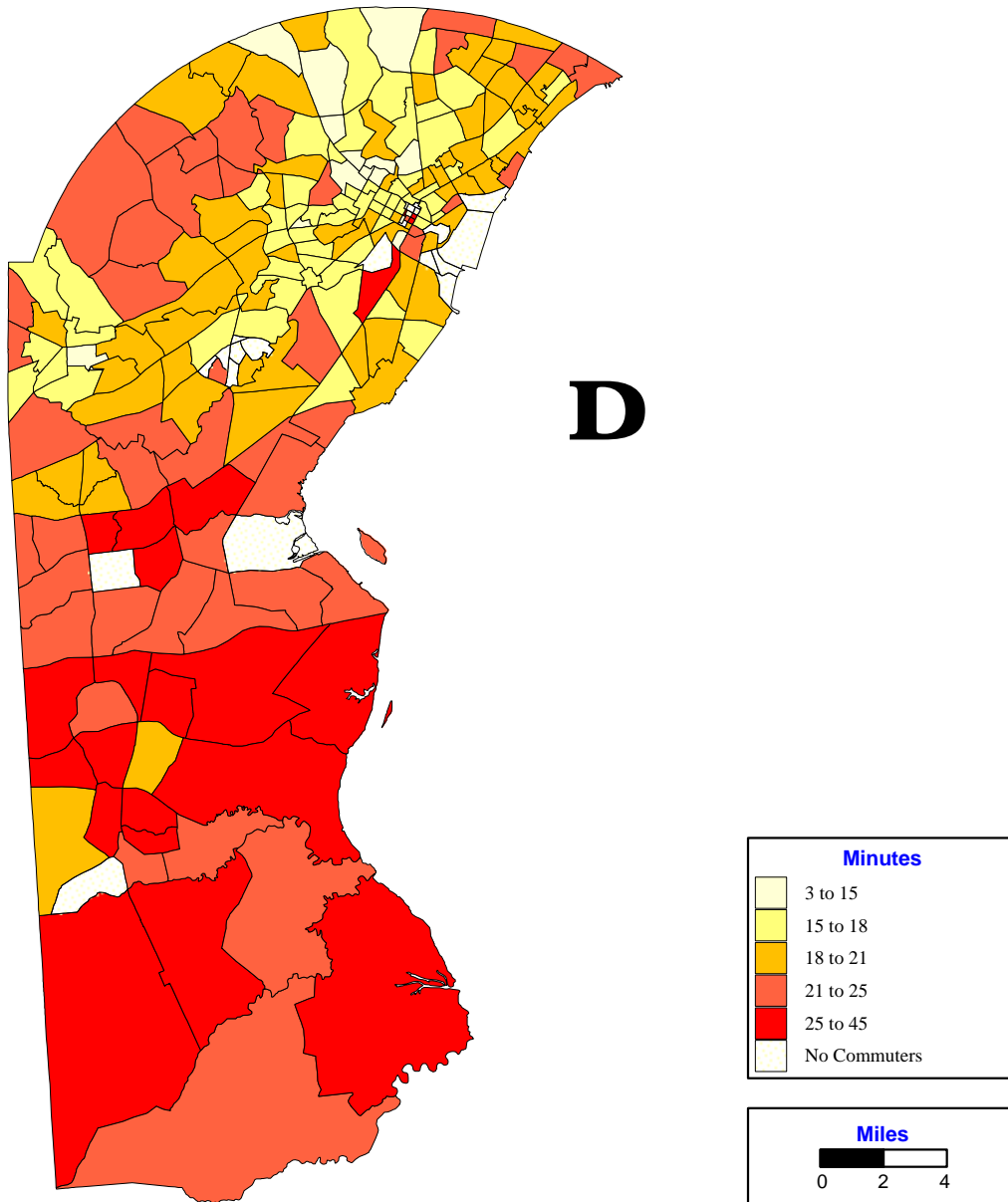
Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-14
Percent Working at Home
by Traffic Zone of Residence in New Castle County, DE - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware

Figure A-15
Average Travel Time to Work
by Traffic Zone of Residence in New Castle County, DE - 1990



Source: Center for Applied Demography and Survey Research, University of Delaware