Modeling Support and Examination of Census Transportation Planning Package

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16.Abstract

A Metropolitan Planning Organization is responsible for traffic modeling and traffic forecasting within its region. It uses these traffic forecasts to develop its Transportation Improvement Plan, a five-year plan of needed roadway repairs, improvements, or construction projects. This research focused on three general themes for improving transportation planning and management of a community's transportation system for Metropolitan Planning Organizations within Alabama.

The first theme involved developing and teaching workshops on traffic modeling and TRANPLAN, a software package that is difficult to learn and operate for planning purposes. The second general theme examined of the difference between regional and local traffic modeling and developed a regional-to-local modeling system to allow a similar model to be used for different levels of analysis. The regional-to-local modeling system developed by this project used TRANPLAN (regional forecasting tool) and CORSIM (local network micro-simulation package). The final theme was a review of the Census Transportation Planning Package to summarize and disseminate transportation data for the state and its urban areas.

17.Key Words Travel forecasting, Traffic simulation, Technology transfer	**18.Distribution Statement**

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Executive Summary

This research report contains three general themes focusing on improving transportation planning and management of a community's transportation system. The first theme supports transportation planning activities throughout the state. This involved individual training sessions and group workshops with transportation planners from the state's Metropolitan Planning Organizations, tailored for different levels of transportation modeling knowledge. A secondary task of this theme was an examination of different traffic modeling software packages as requested by the Alabama Department of Transportation.

The second theme focuses on developing a software interface to pass data from regional to local traffic programs. The developed linkage allows data from TRANPLAN to be used in a CORSIM analysis. In this approach, TRANPLAN is used to distribute trips and develop network travel patterns and CORSIM is used to incorporate intersection control effects. It also calculates improved estimates of link travel times, delays, levels of service, and air quality measures.

The third theme focuses on an evaluation of the Census Transportation Planning Package (CTPP) to identify important transportation characteristics for Alabama and the metropolitan areas performing transportation planning. The CTPP review and data pertinent to transportation planning within Alabama were extracted and are disseminated in this report.

Overall, the project provides tools and support to transportation planners in Alabama to improve the planning process. This will lead to better decisions regarding the transportation infrastructure of Alabama.

Section 1
Introduction

A Metropolitan Planning Organization (MPO) is responsible for all traffic modeling and traffic forecasting. It uses this information, in cooperation with the state department of transportation, to develop the area's Transportation Improvement Plan (TIP), a five-year plan of needed roadway repair, improvement, or construction. In the past decade, many tools have been developed to assist transportation planners in modeling and forecasting transportation for use in preparing the TIP. Currently, MPOs are using the traffic modeling and forecasting tool TRANPLAN, a software package that is designed for evaluating regional travel demand, essentially, future flows of traffic across the community. Recently, interest has been shown by transportation planners in modeling and forecasting local travel demand, which TRANPLAN can not accomplish efficiently. Fortunately, there have been advances in other tools that assist transportation planners in developing TIPs.

This research report contains three general themes focused on improving transportation planning and on management of a community's transportation system. The first involved enhancing the use, understanding of, and desire to continue to use TRANPLAN, which is popular but difficult to learn and use for planning applications. In addition, many MPOs have recently hired new transportation planners and the level of TRANPLAN knowledge is changing. To reduce the trouble that many MPOs were having with the software, individual and group workshops were conducted for transportation planners from the state's MPOs. The workshops were tailored to the different levels of transportation modeling knowledge found throughout the state. This research examined different traffic modeling software packages, as requested by the Alabama Department of Transportation, as alternates to or improvements for TRANPLAN.

The second general theme of this research dealt with the difference in regional and local traffic modeling, and developed a regional-to-local modeling system that allows similar models to be used for different levels of analysis. The intended regional-to-local modeling system consists of TRANPLAN, the current regional forecasting tool, and CORSIM, a local network micro-simulation package. Both pieces of software are available at each MPO. The linkage between the software packages allows data from the TRANPLAN model to be used in the CORSIM analysis of localized improvements. In this approach, TRANPLAN is used to distribute trips and develop network travel patterns. An interface between TRANPLAN and GIS (documented in a previous report) can be used to effectively store, manage and present model data. Interface software was be written to: (a) convert network geometry and traffic patterns from TRANPLAN into the format required by CORSIM, (b) incorporate intersection control effects, and (c) calculate improved estimates of link travel times and delays. The work consisted of developing software code and procedures to integrate the two packages.

The third general theme of this project was an evaluation and review of the Census Transportation Planning Package (CTPP) to identify important transportation characteristics for Alabama and the metropolitan area to be incorporated into traffic modeling. Data pertinent to transportation planning within Alabama were extracted through the CTPP review and are disseminated through this report.

The report contains five chapters. The first chapter outlines the tasks involved in the research project. The second chapter documents the workshops and training activities held to increase transportation planning knowledge throughout the state, and presents a review of the alternative transportation modeling programs being considered by the state of Alabama. The third chapter examines the regional-to-local modeling environment developed in this project. The software conversion program allows users of the travel demand model, TRANPLAN or CUBE, to export the network data into a micro-simulation program to generate real-time images and statistics. The fourth chapter examines the Census Transportation Planning Package and identifies specific information for the state and urban areas that can be used to support transportation planning. The final chapter presents the conclusions of this research effort.

Section 2
Training and Software Evaluation

The first main task of this research focused on training and software evaluation. The training component of this work was handled through several scheduled workshops, meetings, and individualized training sessions. The software evaluation was performed by working with the new software packages being considered and with MPOs representatives.

There were two major workshops held with MPO representatives from around the state. The first was held in Montgomery and focused on trip generation and proper implementation of trip generation in the four step urban planning process. The workshop was attended by representatives from all of the MPOs in Alabama, as well as members of the Alabama Department of Transportation (ALDOT) and several consulting companies in Alabama and Georgia.

The second workshop was held in Tuscaloosa and focused on travel rate indices for Alabama's urban communities. Attendees included MPO representatives and ALDOT personnel. The focus of this workshop was to examine and discuss the status of transportation characteristics in urban communities. The discussions focused on the cost of congestion and fuel for urban areas, and possible methods to reduce the impact of transportation on the economy. In addition, this meeting was a forum for selecting software to support transportation planning in Alabama for the next several years.

The workshops were not the only training undertaken by this project. In addition, individual MPOs coordinated on-site training sessions for representatives of various agencies. These training sessions focused on topics such as an introduction to planning and modeling, analysis of external trips, reporting of output, calibration and validation of travel models and geographic information system integration with travel models. A listing of areas visited during this project included:

- Auburn/Opelika,
- Birmingham,
- Huntsville,
- Muscle Shoals, and
- Mobile.

The portion of the project that reviewed software packages included meetings with developers and representatives from various software companies and MPOs, as well as testing the software packages. The two software packages considered by the Alabama Transportation Planners Association were TransCAD from Caplier Corporation, and CUBE from Citilabs Corporation.

The two software packages differed in their approach to transportation planning and in the integration of geographic information systems (GIS) into the modeling process. TransCAD combines travel demand modeling functionality into an existing GIS package. Some views from TransCAD are included as Figures 2-1 and 2-2. CUBE intended to be compatible with TRANPLAN files that are currently being used for travel demand modeling in Alabama. The CUBE software provides an interface to develop and write control files in an automated procedure, versus the manual procedure currently required. It also provides GIS capabilities through VIPER. Some screens generated by CUBE and VIPER are shown in Figures 2-3 and 2-4.

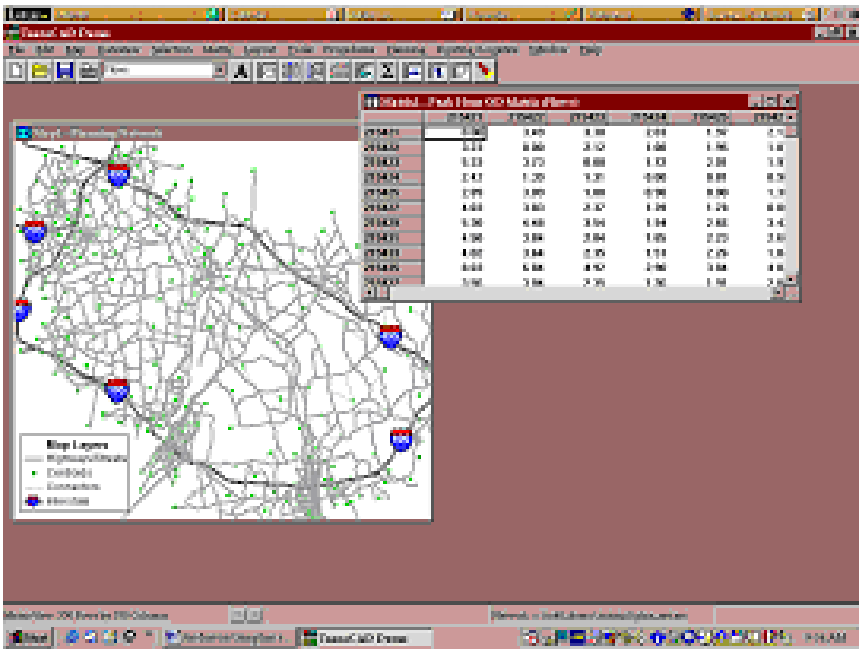

Figure 2-1. TransCAD screen showing network and OD matrix

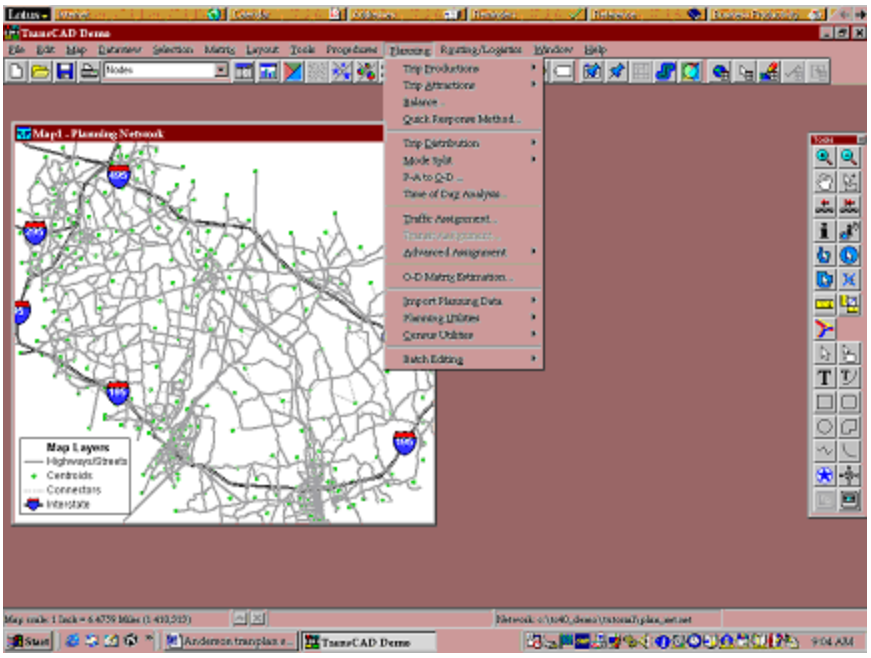

Figure 2-2. TransCAD screen showing planning menu functions

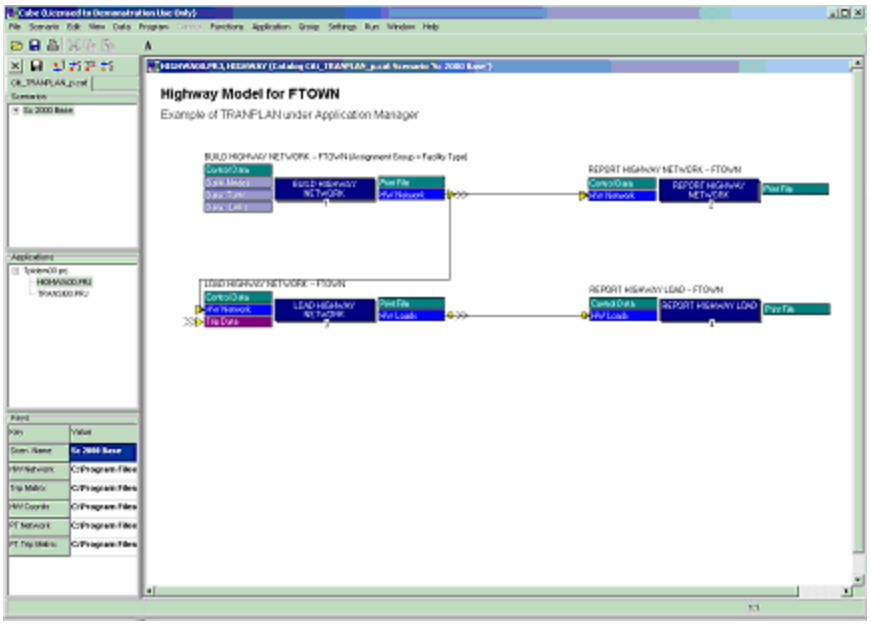

Figure 2-3. CUBE screen showing automated control file writer

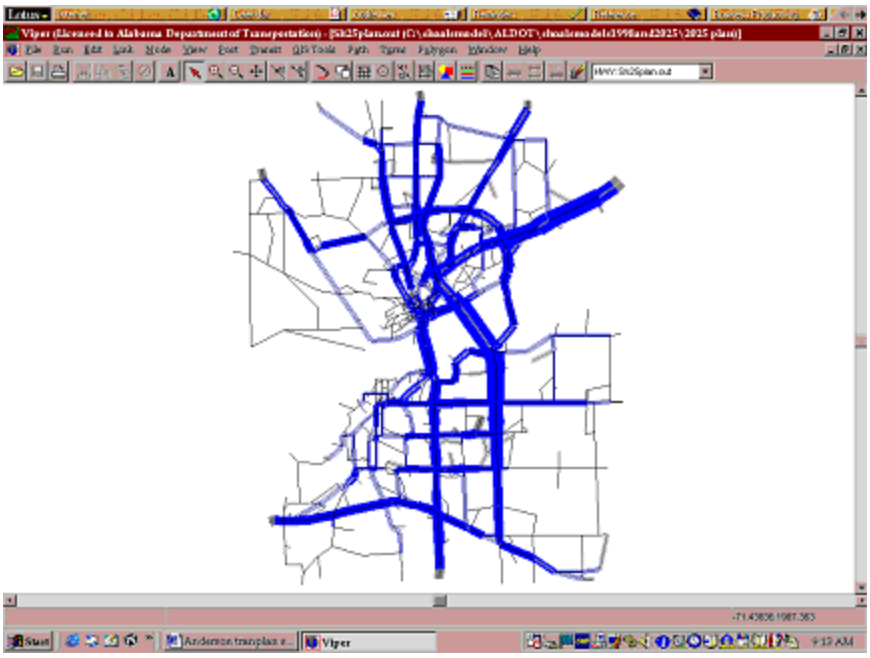

Figure 2-4. VIPER screen showing a network with flows

After reviewing the two software packages for functionality, ease of use, reporting capabilities, and overall satisfaction, the members of the Alabama Transportation Planning Association selected CUBE software (with VIPER as the GIS) as the tool to support the next model updates and long-range planning efforts. To support the needs of the Alabama Transportation Planners Association, time was devoted to learning the CUBE software.

Section 3
Coding of the Local Network Analysis Software

The second task in this research project was the development of a tool to enable region models to support localized transportation analysis. This task was addressed by the development of a software interface program to allow TRANPLAN, a regional model currently used in Alabama, to supply flows and roadway information into CORSIM, a micro-simulation program that can provide localized information on traffic conditions.

During the course of this project, two different software programs were developed to interface the TRANPLAN and CORSIM packages. The first takes information from a complete TRANPLAN network and converts it into a CORSIM file. The second works with a sub-area network from TRANPLAN and converts it into a CORSIM file. The reason that two programs were needed was the slight difference in model structure when using the entire network versus the sub-area. The review of conversion software in the remainder of this section focuses on the sub-area network model, since it will be the most commonly used version of the software in the state.

To begin the software review, an existing TRANPLAN network for Huntsville, Alabama was used. The network contained speed, capacity, and assigned model volumes for the roadways as well as underlying geometric characteristics. The entire network is shown in Figure 3-1. The Huntsville network required the development of a sub-area network for incorporation into CORSIM. Using this information, a sub-area was selected from the network to be used for the analysis. The sub-area is shown in Figure 3-2.

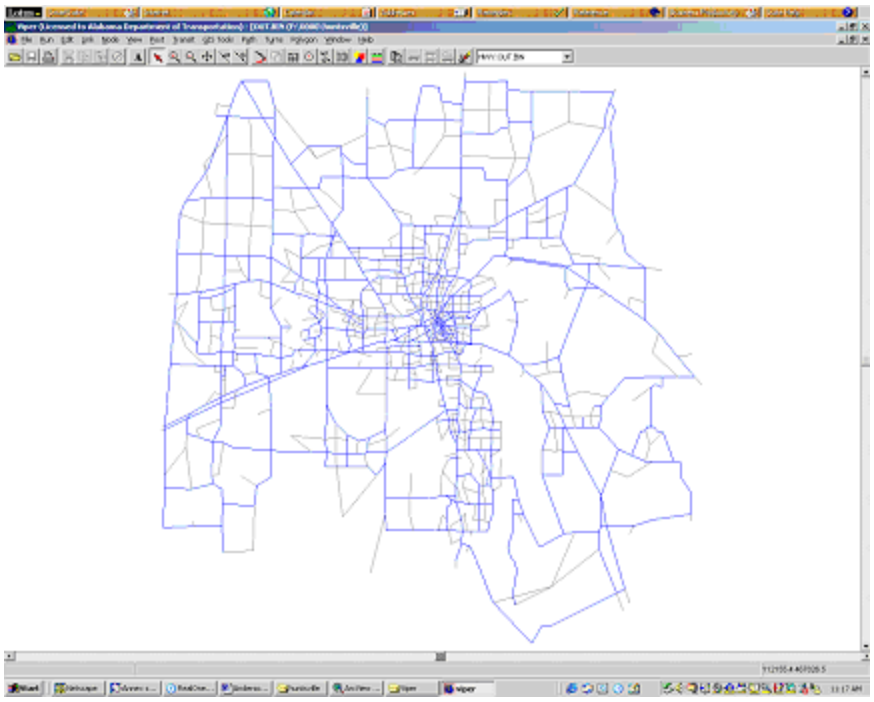

Figure 3-1. VIPER screen showing the entire Huntsville network

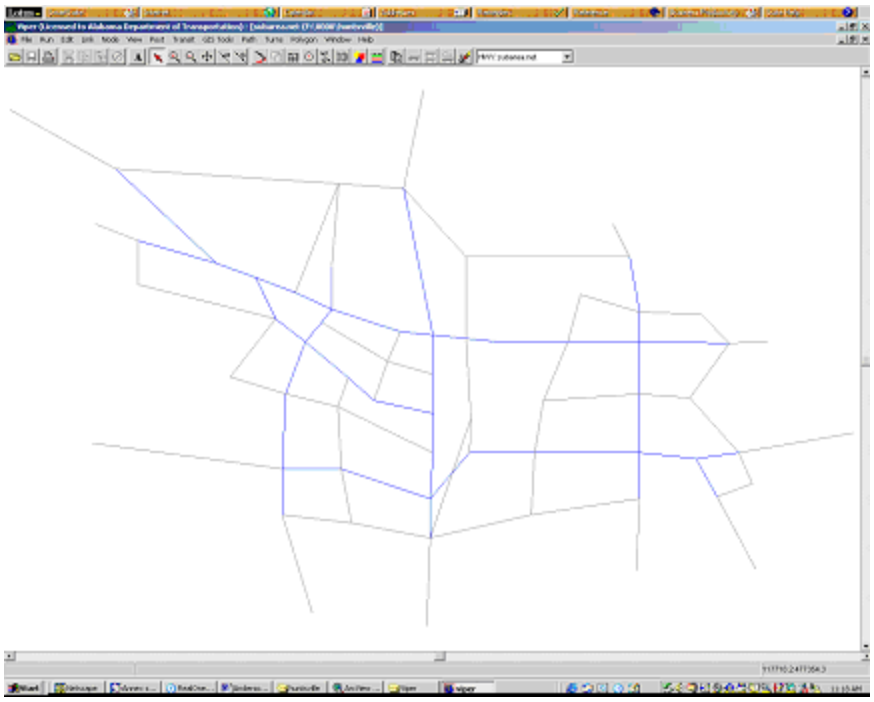

Figure 3-2. VIPER screen showing the sub-area from the Huntsville network

After defining the sub-area, the associated network can easily be exported into Arc/View format using network editing tools available in VIPER (Citilabs program with GIS capabilities). This is necessary since VIPER is not capable of exporting the node and link data as text files. Once the sub-area network is incorporated into Arc/View, the attribute tables for the nodes and links can be exported into text files, which are required for the conversion software written during the project. The link attribute table in Arc/View contains the geometric characteristics, speeds, distances, capacities, and assigned volumes. The link attributes for model volume are used as entry volumes in the simulation, and are automatically reduced to 10 percent of their initial values to represent peak hour traffic. The nodes attribute table in Arc/View contains the coordinate values for the nodes and a reference column showing the original node number, before the sub-area extraction. This is a vital piece of information, as the turning movement file from TRANPLAN will have the original node numbers. Figure 3-3 shows that same sub-area network in Arc/View.

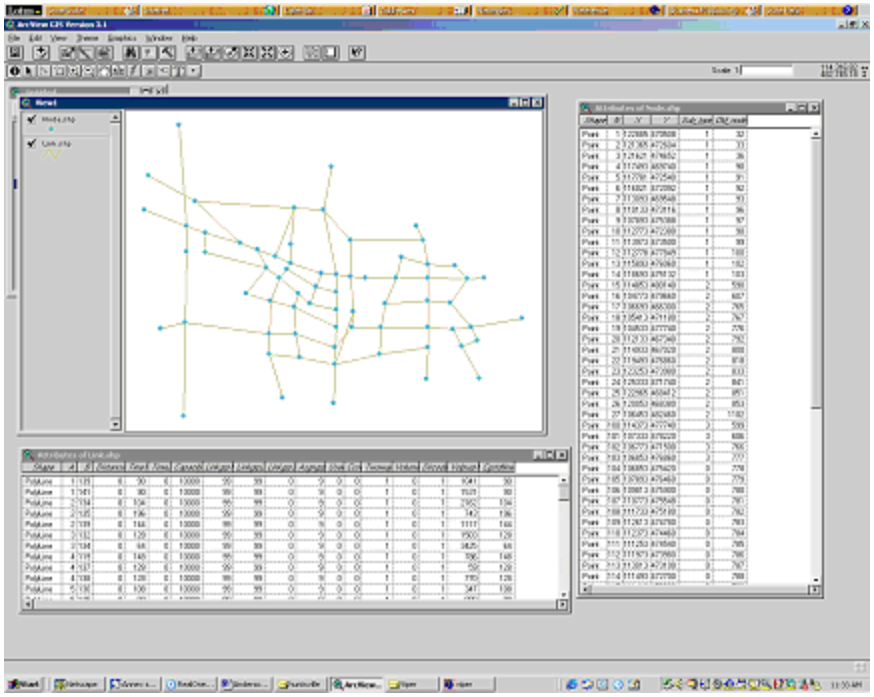

Figure 3-3. Arc/View screen showing the sub-area from the Huntsville network

From Arc/View, the data can be exported into the text files required for the conversion software. The three files needed for the conversion software are nodes, links and turning movements. As stated, the node and link files are exported from Arc/View and the turning movement file is generated during the traffic assignment step when running TRANPLAN. The “save turns” option must be present in the traffic assignment control file for TRANPLAN.

After the files are collected, the next step is to bring these files into the conversion software. The program prompts the user for the number of entry/exit nodes, the file names and locations, an

output file name, and intersection traffic control. A browse option linked to standard windows-based programs assists the user in entering the files.

After entering the filenames, the program allows the user to select the traffic control at each intersection. This is a requirement, as TRANPLAN does not take intersection traffic control into the modeling process. The options for traffic control include, no control, any of the 12 options available in the CORSIM manual, and a default two phase traffic signal with each phase consisting of 30 seconds of green time. For ease of operation and quick analysis, a graphic showing the orientation of the intersection and an "Apply to All Nodes" option are included. Figure 3-4 shows the traffic control entry screen from the software.

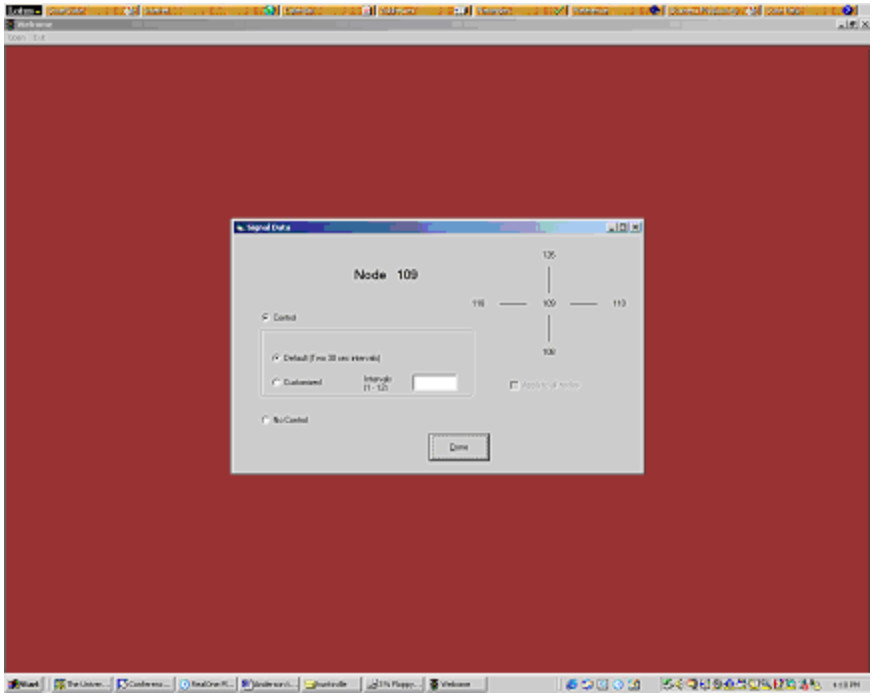

Figure 3-4. Traffic control entry screen

The output of the conversion software develops a file that is formatted as a CORSIM input file structure. This file can then be opened in CORSIM and the simulation can be performed for the sub-area network. The results can be viewed in TRAF-VU, an animation software that accompanies CORSIM. The simulation of the sub-area network using CORSIM provides a significant amount of data that is not currently available when using TRANPLAN alone. First, the CORSIM output contains specific information related to delay at individual intersections and intersection approach levels of service. Second, CORSIM provide information on traffic queues at the intersections. Finally, CORSIM provides a measure of air pollution associated with the roadways in the sub-area network. The animation of the sub-area network allows the modeler to view the results of traffic conditions, in near real-time. Figure 3-5 shows the network in the animation software program TRAF-VU and figure 3-6 shows a single intersection in detail.

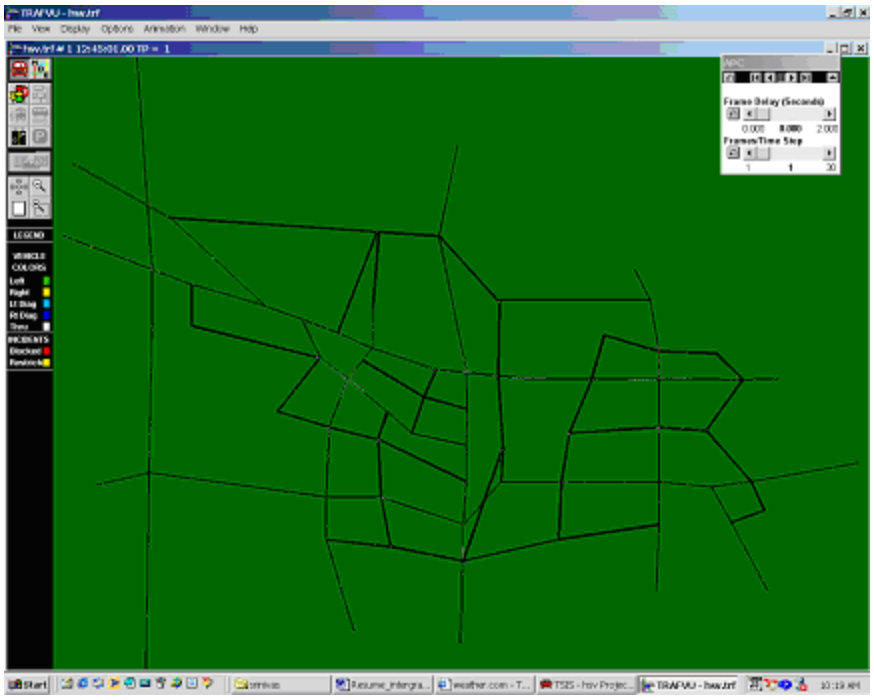

Figure 3-5. Sub-area network in animation program

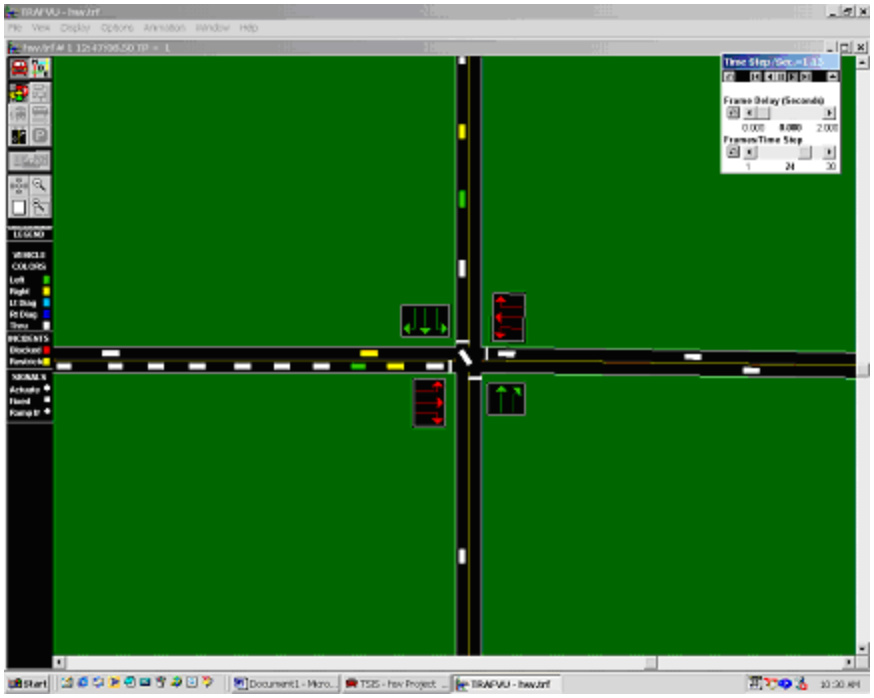

Figure 3-6. Single intersection in animation program

Section 4
Analysis of the Census Transportation Planning Package for Alabama

The third task of this research project was an analysis of the Census Transportation Planning Package (CTPP) for the state and for MPOs. The analysis of the CTPP for Alabama is divided into five major categories of interest for transportation planners.

Household Size

Household size is an important factor for transportation planers to understand, as an indication of the nature of population characteristics within their region. This information is incorporated into the trip generation module of the urban planning process. Table 4-1 shows the percent increase or decrease in the number of households based on their size from 1990 to 2000.

Table 4-1. Change in household size for Alabama and the urban counties

	1-person	2-person	3-person	4-person	5-person and above
Alabama	27.79	20.65	10.43	3.8	-3.16
Calhoun	23.52	11.69	-3.39	-11.08	-8.75
Colbert	29.41	18.57	1.78	-5.35	-4.15
Etowah	18.05	13.7	2.85	-8.68	-5.26
Houston	29.41	24.96	13.68	0.62	-13.85
Jefferson	14.31	5.24	1.38	-3.34	-4.27
Lauderdale	33.82	24.04	8.4	4.41	-8.44
Lee	48.44	40.36	41.56	23.57	22.66
Madison	37.94	23.33	8.49	10.25	7.05
Mobile	17.65	16.14	7.62	-2.34	-4.31
Montgomery	24.72	16.31	8.55	-0.56	-10.30
Morgan	30.37	19.91	7.12	0.11	9.2
Tuscaloosa	31.18	21.30	12.51	4.51	-5.23

Table 4-1 shows that there was a statewide increase in the number of households for single, 2-person 3-person and 4-person households. For 5-person households, there was a decrease of 3.16% from 1990. Three counties (Lee, Madison and Morgan) registered an increase in the number of households of all sizes, with Lee County having the highest percent increase in the number of households. Calhoun County was the only county that registered a decrease in the number of 3-person households. Figure 4-1 shows the changes statewide, and the individual county results are contained in Appendix B.

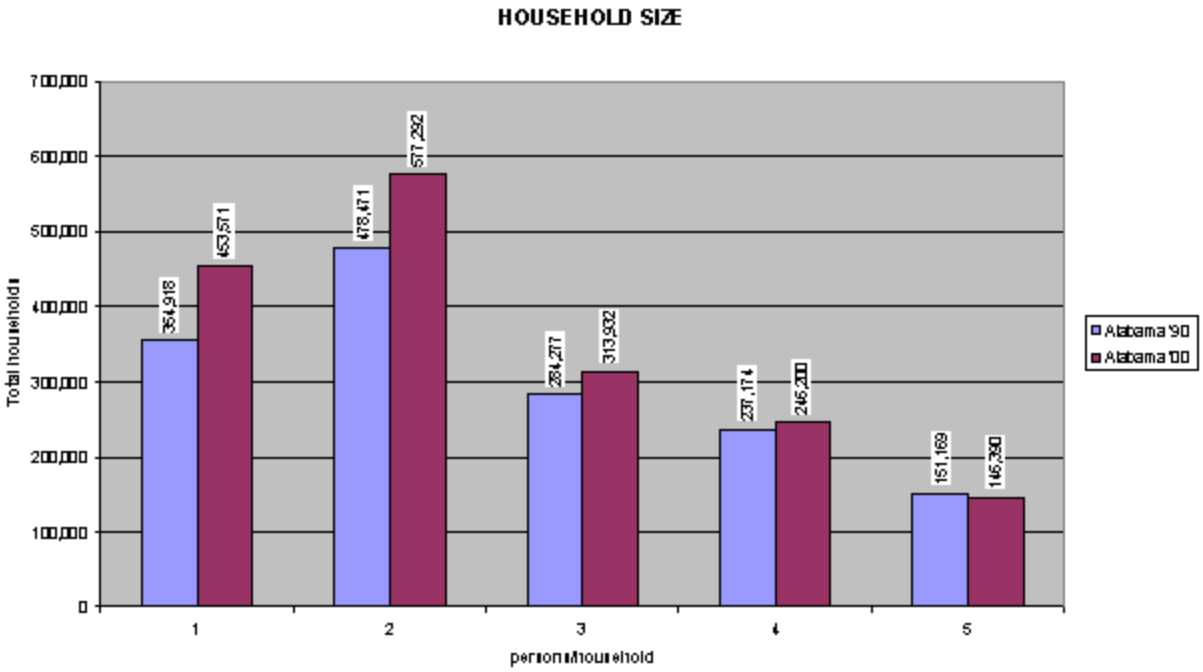

Figure 4-1. Changes in household size statewide

Vehicles Per Household

The number of vehicles per household is another important factor in understanding trip making characteristics, and subsequently, trip modeling for Alabama. Table 4-2 shows the percent increase or decrease in the number of vehicles per household from 1990 to 2000.

Table 4-2. Change in household size for Alabama and for the urban counties

	No-vehicle	1-vehicle	2-vehicles	3-vehicles	4-vehicles	5 or more vehicles
Alabama	-6.29	21.29	17.64	15.12	7.36	10.49
Calhoun	-4.93	10.83	7.48	7.67	14.40	-1.16
Colbert	-10.80	21.56	17.02	5.58	-5.01	-8.07
Etowah	-9.21	20.40	10.02	-4.41	-0.71	16.49
Houston	2.13	32.45	15.09	-2.97	9.25	33.88
Jefferson	-11.01	12.77	2.73	5.01	-1.54	10.89
Lauderdale	-8.39	23.93	22.61	17.85	2.73	-14.79
Lee	31.24	51.75	35.29	37.22	19.41	-5.23
Madison	8.5	26.40	20.95	21.11	1.98	2.87
Mobile	-12.53	14.09	10.50	9.99	17.83	11.13
Montgomery	-6.64	21.74	13.84	5.38	-10.23	-25.50
Morgan	-4.47	30.89	14.80	7.53	3.81	9.91
Tuscaloosa	-3.76	25.64	17.27	11.28	18.10	35.82

Table 4-2 shows that Houston, Lee and Madison counties recorded an increase the number of households that did not own any vehicle, while Lee County registered a surprising 31.24% increase in the number of households without a vehicle. Tuscaloosa County had the highest increase in the number of households that owned 5 or more vehicles. Madison County was the

only county that registered an increased number of households in all categories. Figure 4-2 shows the changes that occurred statewide, and the individual county results are contained in Appendix B.

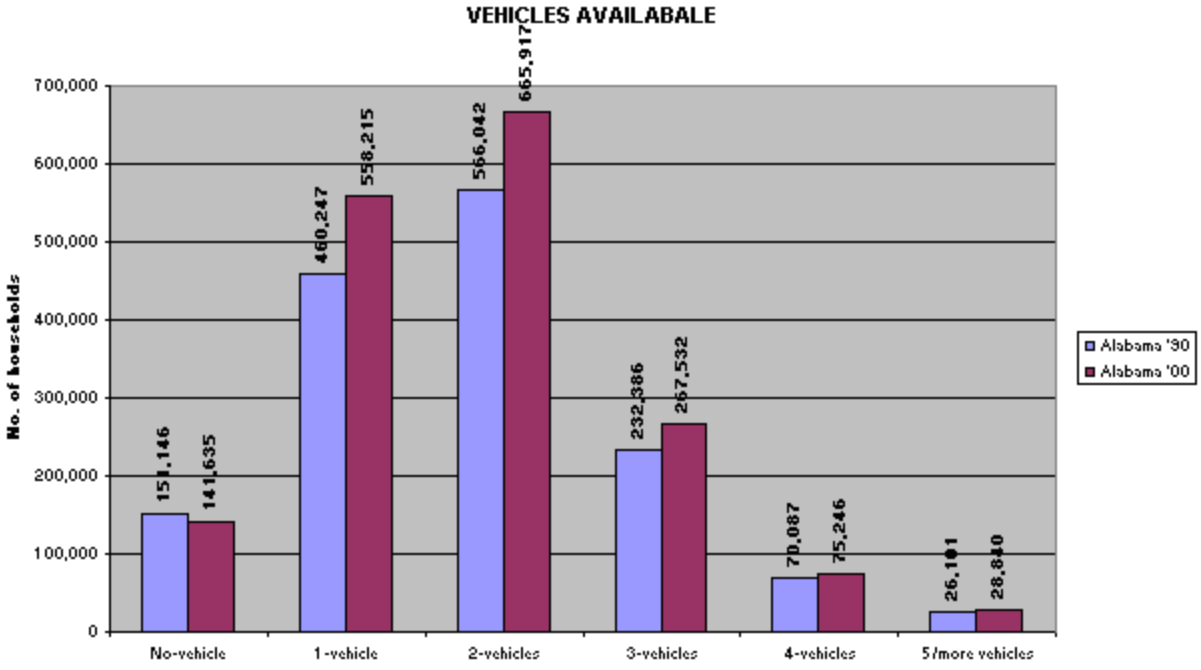

Figure 4-2. Number of vehicles available per household for Alabama

Household Income

Household income is another important factor in understanding trip making characteristics, and consequently, trip modeling for Alabama. This variable is used as a direct input to the trip generation equations in the ALDOT model. This value also provides some information about the current state of employment and wealth distribution in the Alabama. Table 4-3 shows the number of households in each income category, and Table 4-4 shows the percentage of households in each income category.

Table 4-3. Household income

	<15,000	15,000 - 19,999	20,000 - 24,999	25,000 - 49,999	50,000 - 74,999	75,000 - 99,999	>=100,000	Total
Alabama	391,406	129,167	128,226	523,344	298,347	134,135	132,760	1,737,385
Calhoun	10,773	3,704	3,632	14,342	7,386	2,853	2,690	45,380
Colbert	5,180	1,754	1,965	7,137	3,600	1,549	1,303	22,488
Etowah	9,787	3,703	3,287	12,982	6,881	2,671	2,323	41,634
Houston	7,995	2,675	2,461	10,878	6,407	2,587	2,858	35,861
Jefferson	52,663	18,024	19,189	77,784	46,211	22,748	26,636	263,255
Lauderdale	8,144	2,905	2,783	11,042	6,013	2,677	2,564	36,128
Lee	13,553	3,316	2,886	11,571	7,497	3,656	3,272	45,751
Madison	16,212	6,548	6,858	31,245	21,890	12,684	14,648	110,085
Mobile	35,054	11,298	10,675	45,385	26,276	11,449	10,118	150,255
Montgomery	17,463	6,025	6,124	26,351	14,749	6,990	8,329	86,031
Morgan	8,058	2,969	3,179	13,261	8,594	3,731	3,723	43,515
Tuscaloosa	15,224	4,739	4,446	18,268	11,320	5,474	5,046	64,517

Table 4-4. Household income percentages

	<15,000	15,000 - 19,999	20,000 - 24,999	25,000 - 49,999	50,000 - 74,999	75,000 - 99,999	>=100,000	Total
Alabama	22.5	7.4	7.4	30.1	17.2	7.7	7.6	100.0
Calhoun	23.7	8.2	8.0	31.6	16.3	6.3	5.9	100.0
Colbert	23.0	7.8	8.7	31.7	16.0	6.9	5.8	100.0
Etowah	23.5	8.9	7.9	31.2	16.5	6.4	5.6	100.0
Houston	22.3	7.5	6.9	30.3	17.9	7.2	8.0	100.0
Jefferson	20.0	6.8	7.3	29.5	17.6	8.6	10.1	100.0
Lauderdale	22.5	8.0	7.7	30.6	16.6	7.4	7.1	100.0
Lee	29.6	7.2	6.3	25.3	16.4	8.0	7.2	100.0
Madison	14.7	5.9	6.2	28.4	19.9	11.5	13.3	100.0
Mobile	23.3	7.5	7.1	30.2	17.5	7.6	6.7	100.0
Montgomery	20.3	7.0	7.1	30.6	17.1	8.1	9.7	100.0
Morgan	18.5	6.8	7.3	30.5	19.7	8.6	8.6	100.0
Tuscaloosa	23.6	7.3	6.9	28.3	17.5	8.5	7.8	100.0

Table 4-3 and 4-4 show that all the urban counties (except Lee) displayed a consistent household income pattern. All counties (except Lee) had a larger percentage of households in the $25,000 - $49,999 income range than any other range. Lee had the largerst percentage of households in the less-than $15,000 category. The number of households in Lee County that earn less than $15,000 outnumber the households that fall in the category of $25,000 - $49,999 by 17.13%. This is assumed to be because Auburn University students were included in the study.

Madison County had the highest median household income ($44,704) and the highest mean household income ($57,221) of all urban counties. Etowah County had the lowest mean household income ($41,041) and Lee County had the lowest median household income

($42,461). Figure 4-3 shows the number of households statewide in each income category, and with the individual county results are presented in Appendix B.

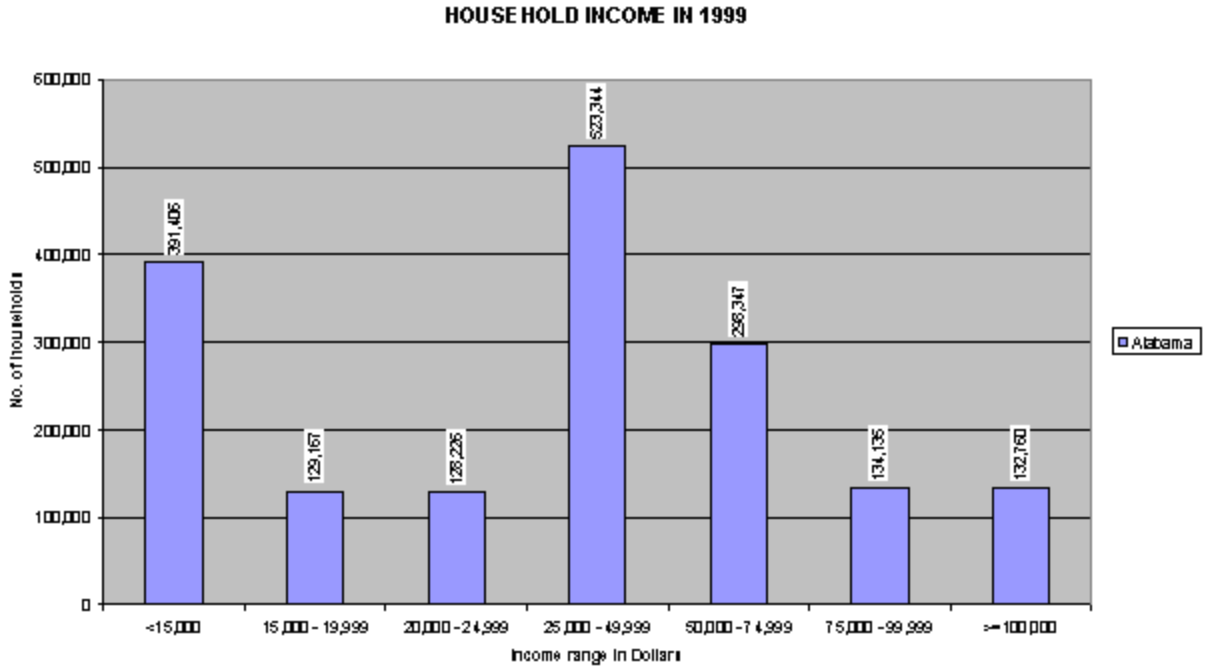

Figure 4-3. Number of households in each income range for Alabama

Travel Time

Another element of the Census Transportation Planning Package that is important for transportation planners is the reported travel time of individuals for their daily work commute. This information is important when calibrating and validating travel models to ensure that the models are assigning the appropriate length trips for different communities.

Table 4-5 shows the number of households making a journey to work on a standard day using eight trip length categories. Table 4-6 shows the percentage change of households making different length work trips in the past 10 years.

Table 4-5. Number of households making different length journeys to work

	<5 min	5-9 min	10-14 min	15-19 min	20-29 min	30-44 min	>=45 min	Workers not working at home
Alabama	58125	196568	284405	323887	396108	356617	245076	1860786
Calhoun	1647	5123	7811	8819	10422	7635	4933	46390
Colbert	996	2691	4101	3660	4768	3363	2771	22350
Etowah	1279	4490	6959	9298	9082	5306	5420	41834
Houston	1363	4858	8624	8719	7935	5313	2534	39346
Jefferson	4932	21276	37317	52567	75663	67170	28094	287019
Lauderdale	1287	4345	6162	6865	8251	6262	4501	37673
Lee	1765	7712	10414	9438	10411	7657	3792	51189
Madison	2949	13180	22608	27260	33998	23148	7762	130905
Mobile	3925	13403	22316	29624	37254	33875	19001	159398
Montgomery	2608	9579	17944	24259	23405	11757	5714	95266
Morgan	1496	5539	8320	8828	9917	9602	5097	48799
Tuscaloosa	2331	8608	14340	15580	14151	9423	7378	71811

Table 4-6. Percent distribution of work trip for different communities

	<5 min	5-9 min	10-14 min	15-19 min	20-29 min	30-44 min	>=45 min	Workers not working at home
Alabama	3.1	10.6	15.3	17.4	21.3	19.2	13.2	100.0
Calhoun	3.6	11.0	16.8	19.0	22.5	16.5	10.6	100.0
Colbert	4.5	12.0	18.3	16.4	21.3	15.0	12.4	100.0
Etowah	3.1	10.7	16.6	22.2	21.7	12.7	13.0	100.0
Houston	3.5	12.3	21.9	22.2	20.2	13.5	6.4	100.0
Jefferson	1.7	7.4	13.0	18.3	26.4	23.4	9.8	100.0
Lauderdale	3.4	11.5	16.4	18.2	21.9	16.6	11.9	100.0
Lee	3.4	15.1	20.3	18.4	20.3	15.0	7.4	100.0
Madison	2.3	10.1	17.3	20.8	26.0	17.7	5.9	100.0
Mobile	2.5	8.4	14.0	18.6	23.4	21.3	11.9	100.0
Montgomery	2.7	10.1	18.8	25.5	24.6	12.3	6.0	100.0
Morgan	3.1	11.4	17.0	18.1	20.3	19.7	10.4	100.0
Tuscaloosa	3.2	12.0	20.0	21.7	19.7	13.1	10.3	100.0

Table 4-7. Percentage change in work trip lengths from 1990 to 2000

	<5 min	5-9 min	10-14 min	15-19 min	20-29 min	30–44 min	>=45 min
Alabama	0.99	-4.22	2.51	-0.83	11.86	14.05	43.4
Calhoun	-25.5	-31.6	-13.8	-18.9	4.5	8.7	55.1
Colbert	35.0	-19.2	7.6	-6.4	17.4	1.6	26.4
Etowah	-8.4	-1.9	-8.7	0.1	9.7	5.0	70.7
Houston	-3.6	-10.4	2.1	-5.5	20.6	20.3	58.8
Jefferson	-4.3	-7.9	-2.7	-6.4	1.4	6.6	32.0
Lauderdale	14.4	-3.5	1.3	7.5	40.0	3.8	32.0
Lee	11.9	22.6	31.9	14.4	44.2	60.2	64.3
Madison	-11.2	4.0	13.7	6.6	11.6	6.8	25.0
Mobile	10.1	-6.8	2.1	-3.8	-0.2	13.2	45.1
Montgomery	-3.0	-11.2	-2.1	-4.1	10.0	5.3	42.4
Morgan	13.7	-4.6	3.4	11.5	14.3	10.0	12.4
Tuscaloosa	1.3	-0.2	8.8	-3.0	23.9	13.8	68.9

Figure 4-4 shows the number of households statewide in each journey length-to-work category for both 1990 and 2000. Individual county results are contained in Appendix B.

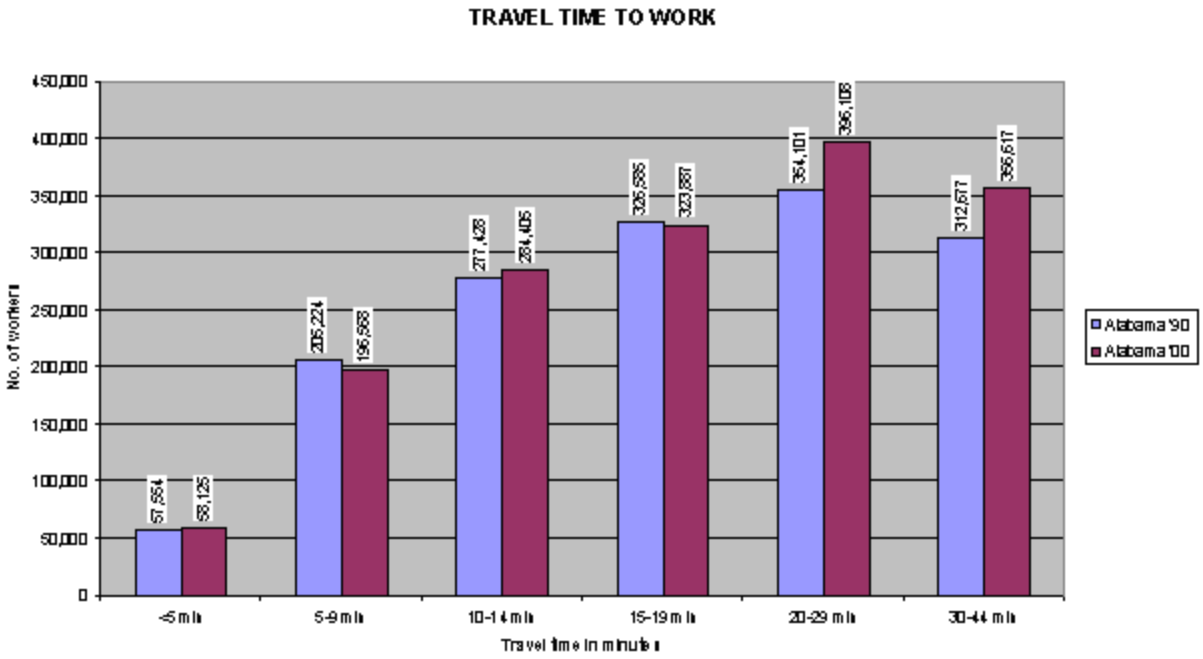

Figure 4-4. Travel time to work for Alabama residents

Means of Transportation to Work

The means of transportation used for the journey to work was the last major item addressed from the Census Transportation Planning Package. Table 4-8 shows the number of households using various modes for their work trip, and Table 4-9 shows the percentage of each mode. Figure 4-5

shows the statewide distribution of travel mode. Individual county results are contained in Appendix B.

Table 4-8. Number of households using each mode for the journey to work

	Drove Alone	Carpooled	Public Transport	Bicycle/walked	Motorcycle/other	worked at home	Total
Alabama	1,576,882	234,020	9,496	26,774	13,614	39,303	1,900,089
Calhoun	40,171	5,011	244	579	385	791	47,181
Colbert	19,682	2,311	34	217	106	243	22,593
Etowah	36,012	5,092	45	383	302	802	42,636
Houston	34,248	4,109	222	405	362	616	39,962
Jefferson	243,720	34,334	3,207	4,025	1,734	5,430	292,449
Lauderdale	32,808	4,006	65	587	207	803	38,476
Lee	43,854	5,629	279	1,133	294	930	52,119
Madison	112,526	15,127	482	1,935	835	3,139	134,044
Mobile	134,335	20,379	1,234	2,258	1,192	2,991	162,389
Montgomery	80,201	12,019	727	1,683	636	1,677	96,943
Morgan	42,543	5,340	82	527	307	970	49,769
Tuscaloosa	61,537	7,799	357	1,762	356	1,481	73,292

Table 4-9. Percent distribution of mode to work

	Drove Alone	Carpooled	Public Transport	Bicycle/walked	Motorcycle/other	worked at home	Total
Alabama	83.0	12.3	0.5	1.4	0.7	2.1	100.0
Calhoun	85.1	10.6	0.5	1.2	0.8	1.7	100.0
Colbert	87.1	10.2	0.2	1.0	0.5	1.1	100.0
Etowah	84.5	11.9	0.1	0.9	0.7	1.9	100.0
Houston	85.7	10.3	0.6	1.0	0.9	1.5	100.0
Jefferson	83.3	11.7	1.1	1.4	0.6	1.9	100.0
Lauderdale	85.3	10.4	0.2	1.5	0.5	2.1	100.0
Lee	84.1	10.8	0.5	2.2	0.6	1.8	100.0
Madison	83.9	11.3	0.4	1.4	0.6	2.3	100.0
Mobile	82.7	12.5	0.8	1.4	0.7	1.8	100.0
Montgomery	82.7	12.4	0.7	1.7	0.7	1.7	100.0
Morgan	85.5	10.7	0.2	1.1	0.6	1.9	100.0
Tuscaloosa	84.0	10.6	0.5	2.4	0.5	2.0	100.0

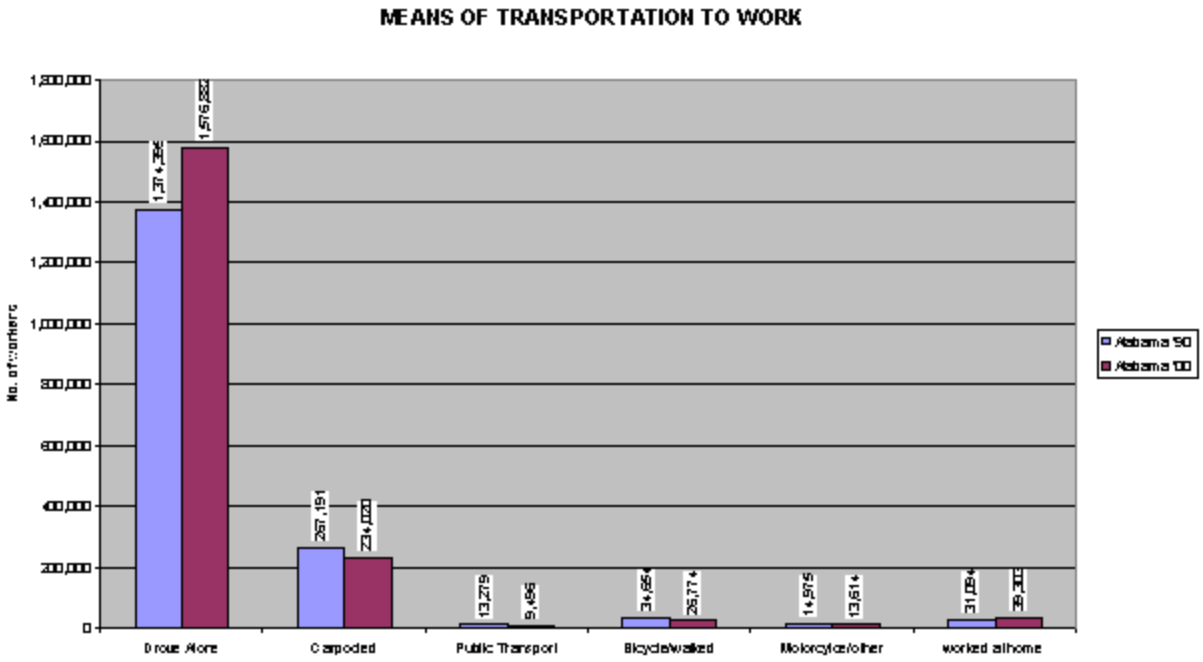

Figure 4-5. Distribution of household mode to work for 1990 and 2000

Examining the data from the Census Transportation Planning Package, all counties, except two (Lee and Etowah) displayed a decline in the number of workers who carpooled to work. Calhoun County was the only county that registered a decrease in the number of commuters in all sectors, implying that the number of workers in the county was declining. The use of public transportation (including taxicab) showed a strong increase in Lee County. The only other county that registered an increase in workers taking public transport to work was Madison County. There was a consistent decline in the number of workers who took a bicycle or walked to work. All counties, except for Calhoun, registered an increase in the number of workers who drove to work alone.

Summary

The Census Transportation Planning Package contains a variety of information that can be used to support urban modeling. This summary discussion of data for Alabama was intended to provide meaningful information on current travel characteristics to improve planning in urban areas.

Section 5
Conclusions

This project focused on three main objectives, which were: (1) supporting transportation planning and GIS through education and meetings with transportation planners in Alabama, (2) developing a software system to convert regional forecasts into a format appropriate for localized analysis, and (3) examining the Census Transportation Planning Package for transportation modeling.

The support of transportation planning and GIS activities was accomplished through a statewide workshop focusing on trip generation, and several individual sessions with transportation planners in MPOs around the state. This task also included a review of potential software programs being considered by transportation planners to replace TRANPLAN. The final decision was to purchase CUBE, an interface program to work with the existing TRANPLAN networks maintained by MPOs.

Conversion software was developed to transfer data from TRANPLAN (the regional forecasting tool) to CORSIM (a localized simulation program) to add modeling capabilities in the state. The software program interfaces regional and local models to allow analysis of delay, queues, level of service, and air quality. This was not available using TRANPLAN alone and without the need to collect considerable data and develop a new model. The interface software was intended as a support tool in comparing projects for implementation at a sketch planning level. For a detailed analysis of traffic conditions developed through the simulation, it is recommended that a new model be developed.

The review of the Census Transportation Planning Package for MPOs was intended to provide a wealth of data about household and travel characteristics of counties in urban areas. This information is important in understanding the number of trips made in the trip generation step of the planning process, and the length of the trip in the trip distribution process.

Overall, the project provided tools and support to transportation planners in Alabama to improve the planning process, and thereby lead to improved decisions regarding the transportation infrastructure of Alabama.

Appendix A
Localized Analysis Software Technical Manual

This software requires three input text files containing the node, link and turning movement data. The development of these files uses VIPER and Arc/View discussed in Chapter 3 of this document. This technical manual will contain additional detail about the format of the data files and operation of the conversion software.

The file type and formats are discussed below.

1. Node File. The node file contains the node number, X coordinate, Y coordinate, sub-area network type, and the old node number. It is important to convert the file manually to have the external station listed first (although the node numbers are not to be changed), followed by the remaining internal centriod nodes, followed by the intersection nodes. A sample node file is shown below:

```
"N","X","Y","Sub_type","Old_node"
15,114853,480140,2,598
16,104773,479660,2,607
17,106693,466300,2,765
18,105413,471180,2,767
19,104533,477740,2,776
20,112133,467340,2,792
21,114933,467020,2,800
22,119493,476860,2,818
23,123253,473980,2,833
24,125333,471740,2,841
25,122965,468412,2,851
26,120053,468380,2,853
27,106453,482460,2,1102
1,122885,470508,1,32
2,121365,472604,1,33
3,121621,474652,1,36
4,117493,469740,1,90
5,117781,472540,1,91
```

2. Links File. The links file contains the from-node number, to-node number, distance, time1 (or speed1), time2 (or speed2), capacity, link group 1, link group 2, link group 3, assignment group, user defined field, cost, two-way indicator, volume (or traffic count),

direction code, assigned model volume, and congested time. A sample link file is shown below:

```
"A","B","Distance","Time1","Time2","Capacity","Linkgrp1","Linkgrp2",
"Linkgrp3","Asgngrp","User","Cost","Twoway","Volume","Dircode","Vo
lpurp1","Cgstdtime"
1,139,0,90,0,10000,99,99,0,9,0,0,1,0,1,1041,90
1,141,0,90,0,10000,99,99,0,9,0,0,1,0,1,1531,90
2,134,0,104,0,10000,99,99,0,9,0,0,1,0,1,2162,104
2,135,0,196,0,10000,99,99,0,9,0,0,1,0,1,743,196
2,139,0,144,0,10000,99,99,0,9,0,0,1,0,1,1117,144
3,132,0,128,0,10000,99,99,0,9,0,0,1,0,1,1503,128
3,134,0,64,0,10000,99,99,0,9,0,0,1,0,1,3425,64
4,119,0,148,0,10000,99,99,0,9,0,0,1,0,1,786,148
4,137,0,128,0,10000,99,99,0,9,0,0,1,0,1,59,128
4,138,0,128,0,10000,99,99,0,9,0,0,1,0,1,770,128
5,130,0,108,0,10000,99,99,0,9,0,0,1,0,1,347,108
5,135,0,88,0,10000,99,99,0,9,0,0,1,0,1,888,88
```

3. Turns File. The turn file contains the from-node, through-node, to-node, and volume. This file is generated by TRANPLAN through the use of the save turns option when running the traffic assignment control file. It is important to remember that the simulation will not work unless the turns are saved from TRANPLAN. A sample turns file is shown below:

FROM	THRU	TO	VOLUME
839	32	1334	0
1334	32	839	0
839	33	835	0
834	33	839	0
835	33	839	0
835	33	834	0
834	33	835	0
839	33	834	0
834	36	816	0
816	36	834	0
837	90	838	0
838	90	803	0
803	90	838	0

After collecting the three required files from TRANPLAN, the next step is to run the conversion program to generate the CORSIM file. This operation is performed by starting the conversion software program by Double clicking on the icon Traffic.exe. Afterwards, the user needs to click

on the “Open” menu option. This will display a new screen prompting the user to enter the number of external entry/exit nodes for the given network (as shown in Figure A-1):

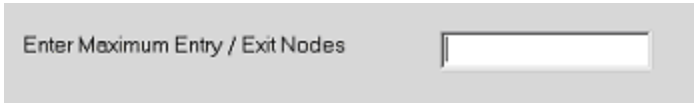

Figure A-5. Node entry

Is it vital that the user enter the correct number, otherwise the generated output file will be incorrect. Afterwards, the user needs to select the input node, link, turns, and output file. A screen has been developed with BROWSE capabilities to assist the user in the step (as shown in Figure A-2):

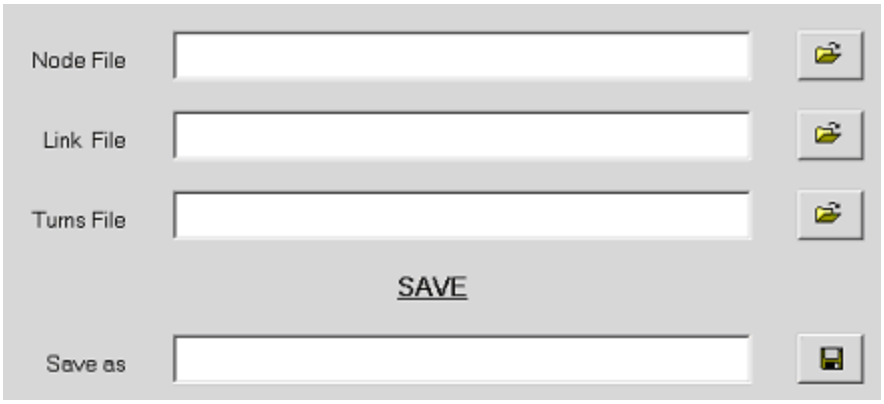

Figure A-2. Input file selection screen

When the correct files are identified, the user needs to click “Convert.” The program then prompts the user for signal information. The program will show the orientation of each node and the user is required to enter the appropriate traffic control for the intersection. There are two main options for traffic control – controlled or no control. If the intersection is a centriod or dummy node used to correct roadway geometry, the no control option should be specified. If the node is an intersection in the network, the user should enter the traffic control. There are two methods for entering traffic control into the program, a default for quick analysis and a customized for more detailed analysis. The default applies a two-phase signal with a 60 second cycle length. The customized entry requires that the user be familiar with the interval options in CORSIM and enter the correct control and phasing. This entry is shown in Figure A-3:

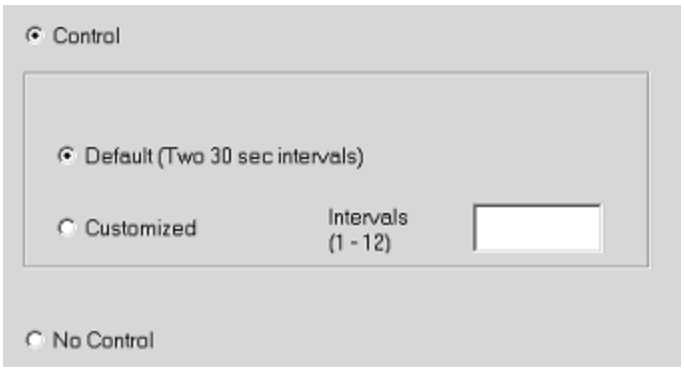

Figure A-3. Intersection control entry screen.

Once the signal control information is entered for all nodes, the program generates a traffic file with a TRF extension that can be simulated in CORSIM. The user should develop a new project in CORSIM with the file included, run the simulation, and take the output from the simulation into TRAF-VU to observe the animation.

Appendix B
CTPP Data for Individual Counties

Household Size

Figure B-1. Household size distribution for Calhoun county

Figure B-2. Household size distribution for Colbert county

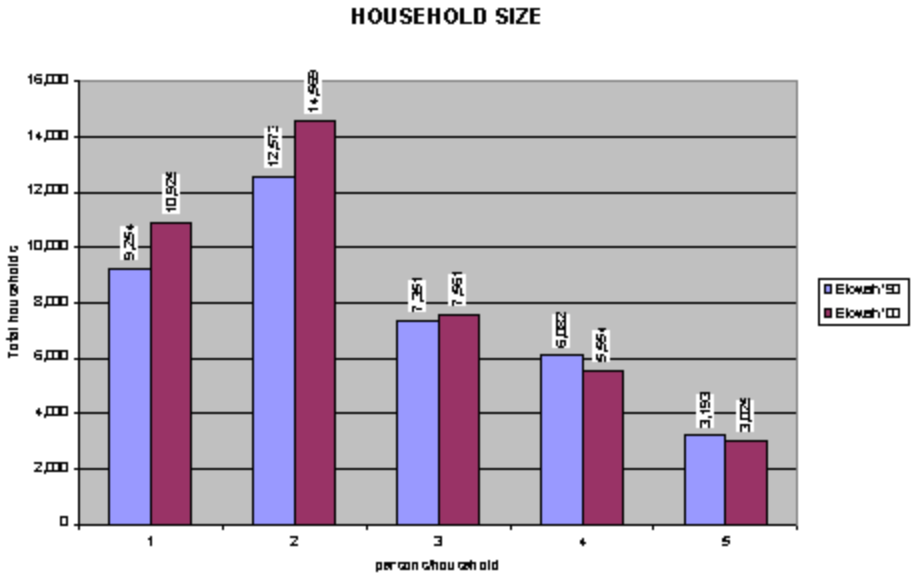

Figure B-3. Household size distribution for Etowah county

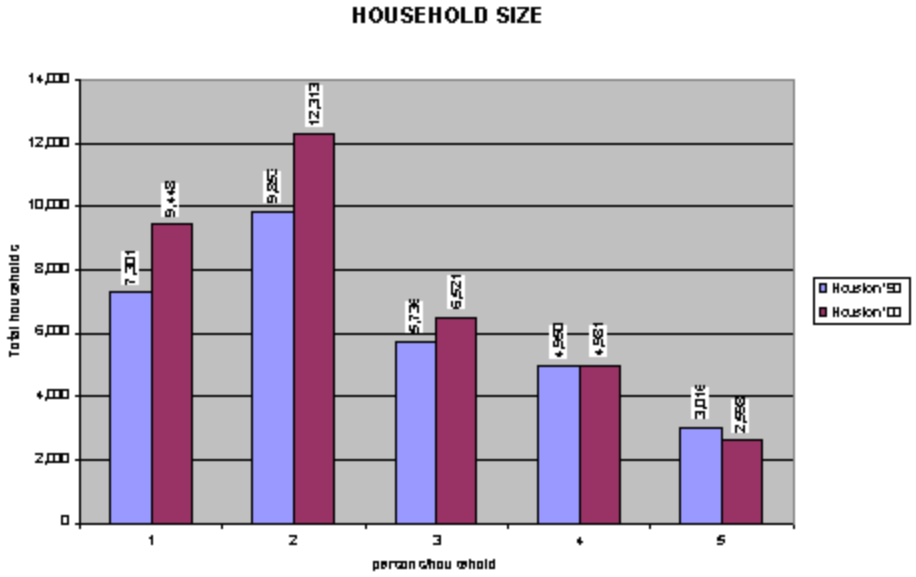

Figure B-4. Household size distribution for Houston county

Figure B-5. Household size distribution for Jefferson county

Figure B-6. Household size distribution for Lauderdale county

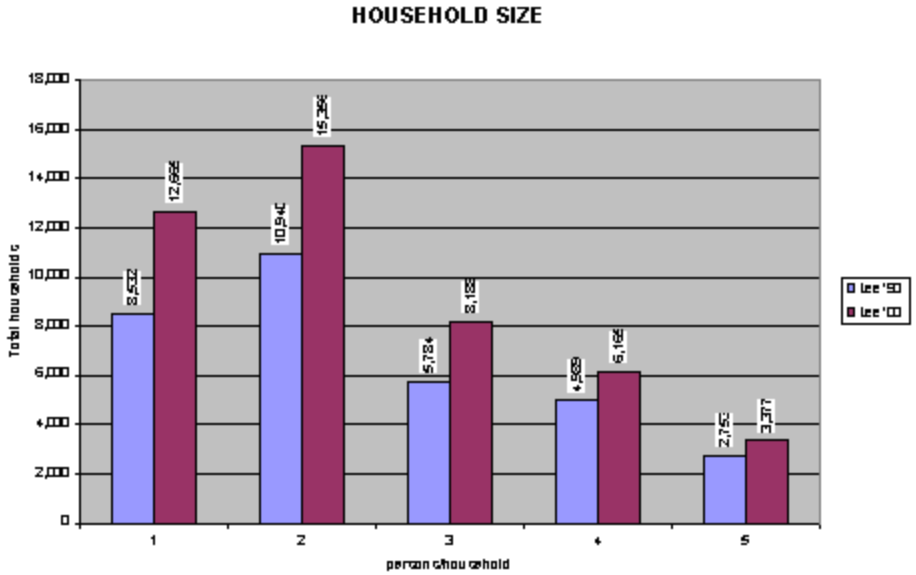

Figure B-7. Household size distribution for Lee county

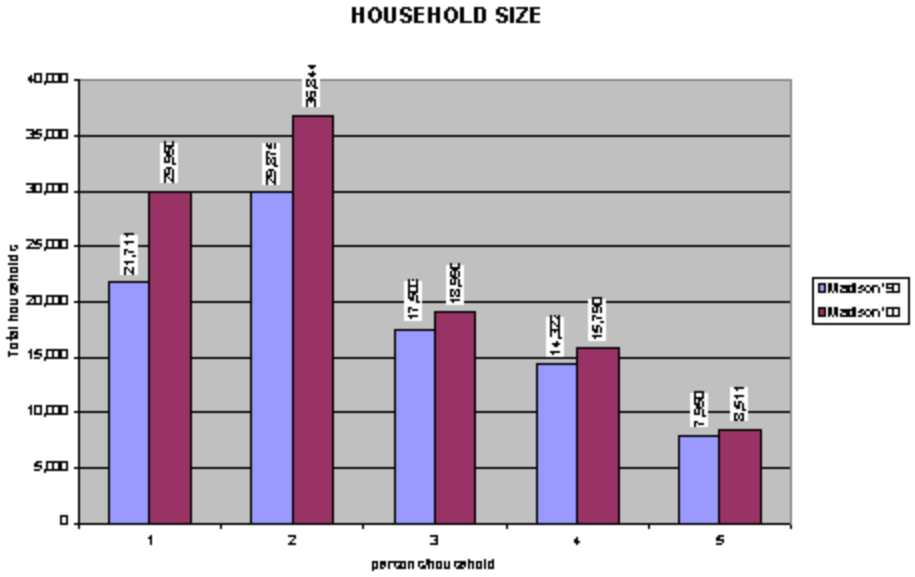

Figure B-8. Household size distribution for Madison county

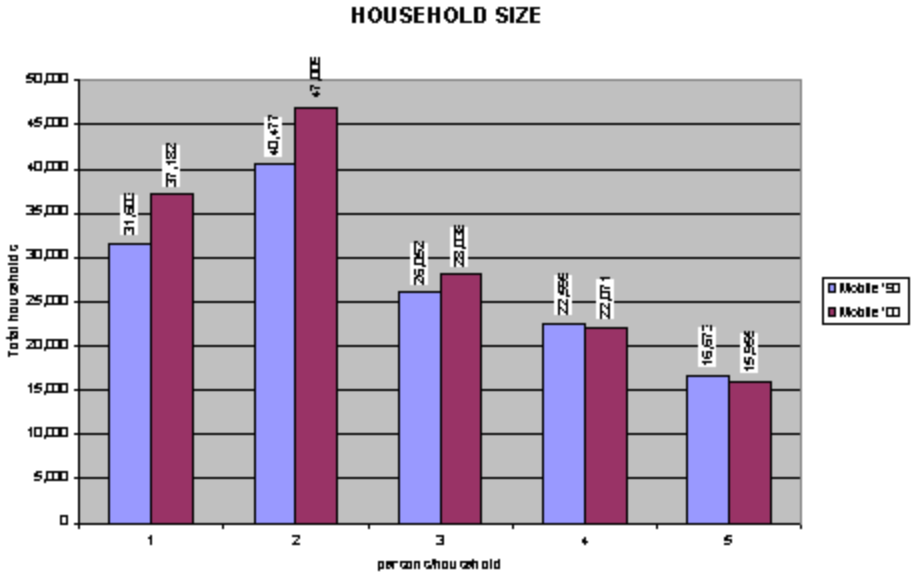

Figure B-9. Household size distribution for Mobile county

Figure B-10. Household size distribution for Montgomery county

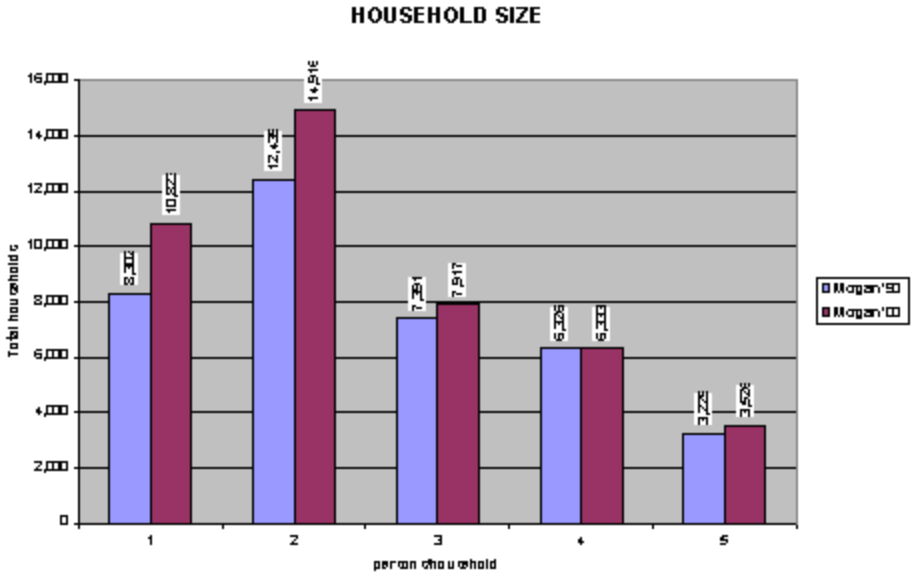

Figure B-11. Household size distribution for Morgan county

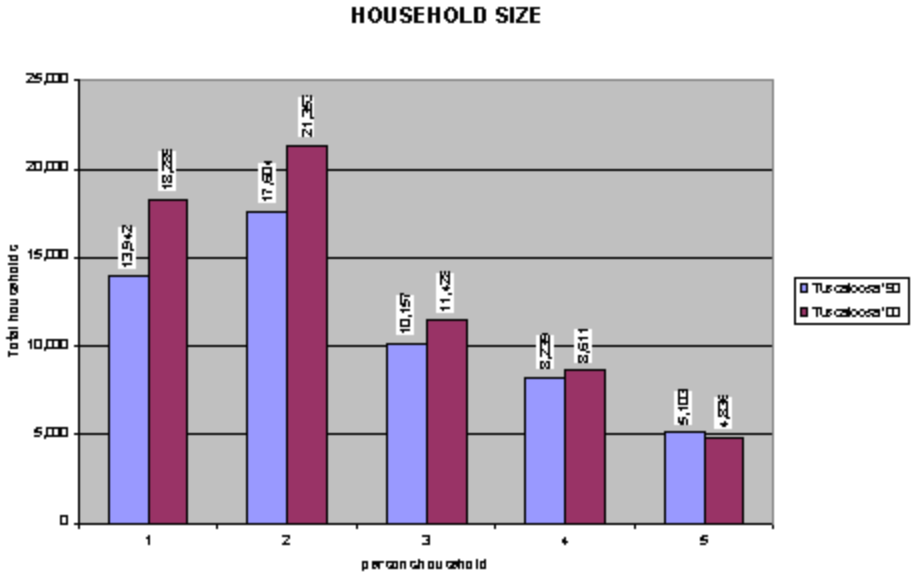

Figure B-12. Household size distribution for Tuscaloosa county

Vehicles per Household

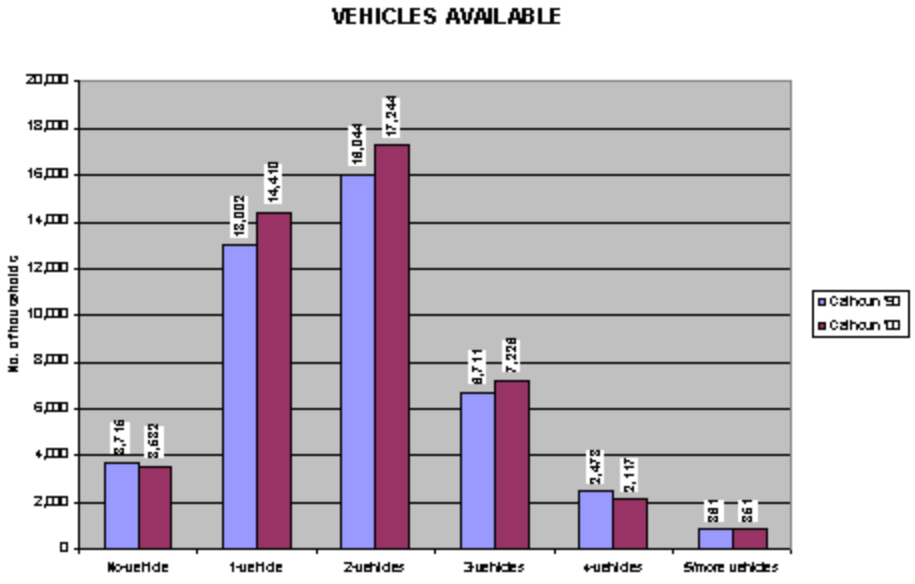

Figure B-13. Vehicles available per household in Calhoun county

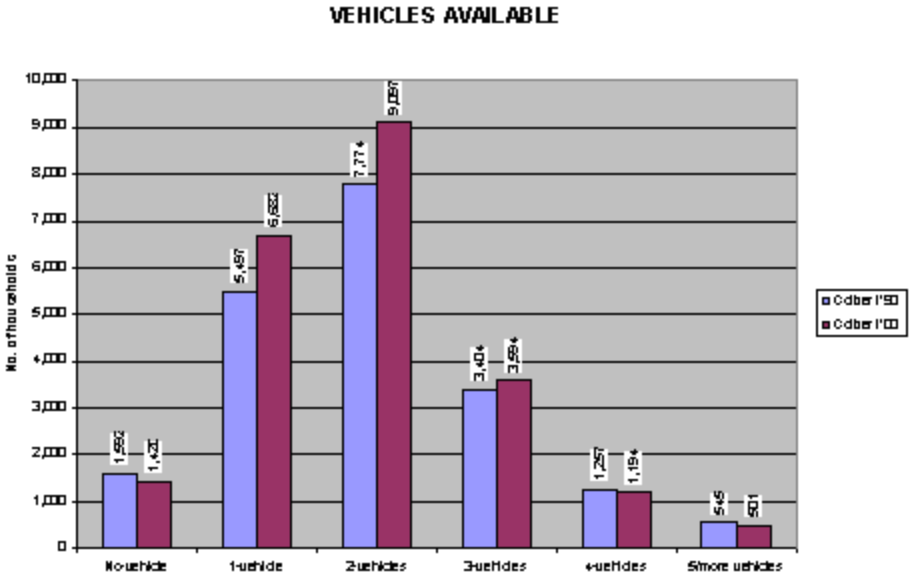

Figure B-14. Vehicles available per household in Colbert county

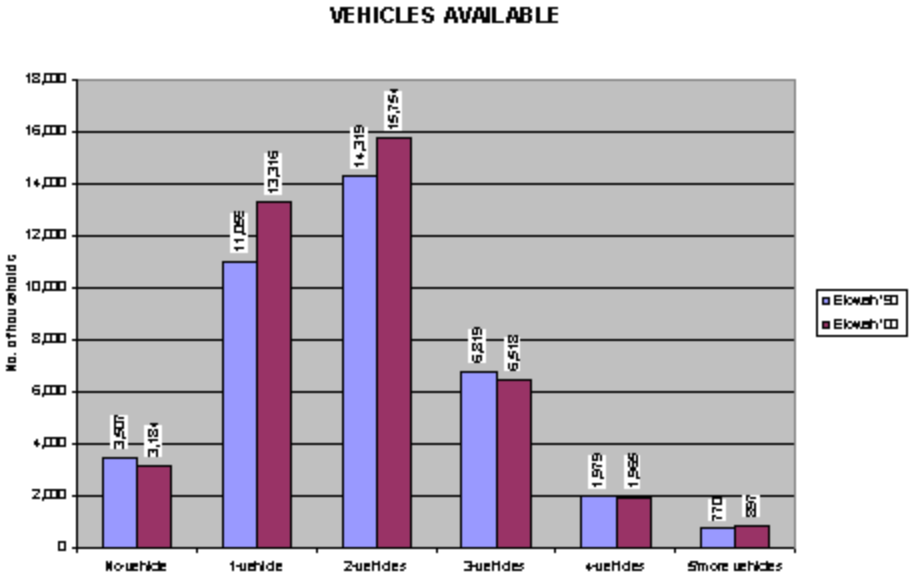

Figure B-15. Vehicles available per household in Etowah county

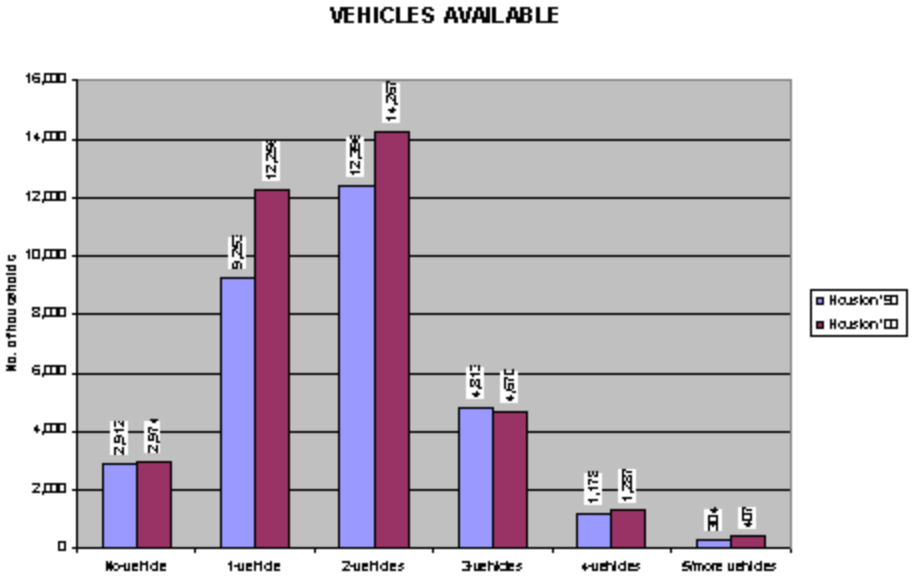

Figure B-16. Vehicles available per household in Houston county

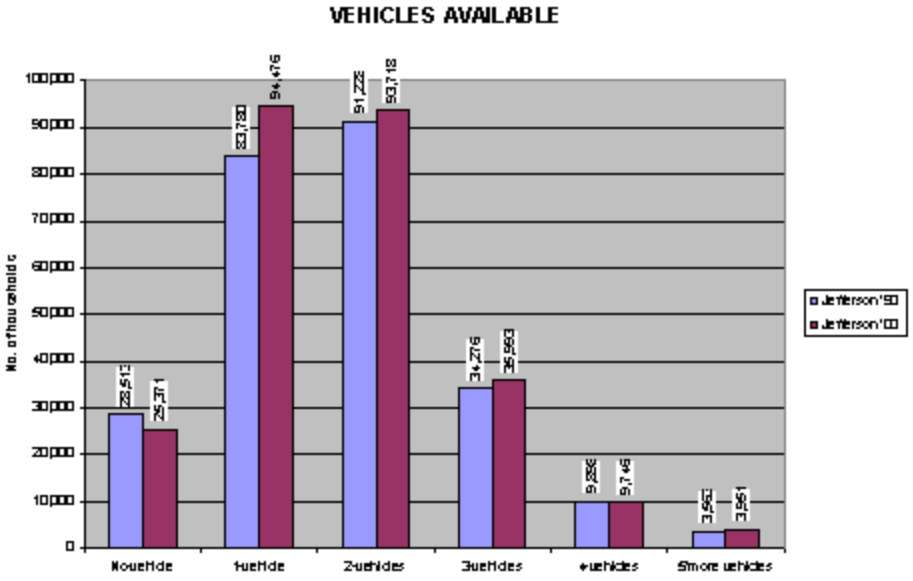

Figure B-17. Vehicles available per household in Jefferson county

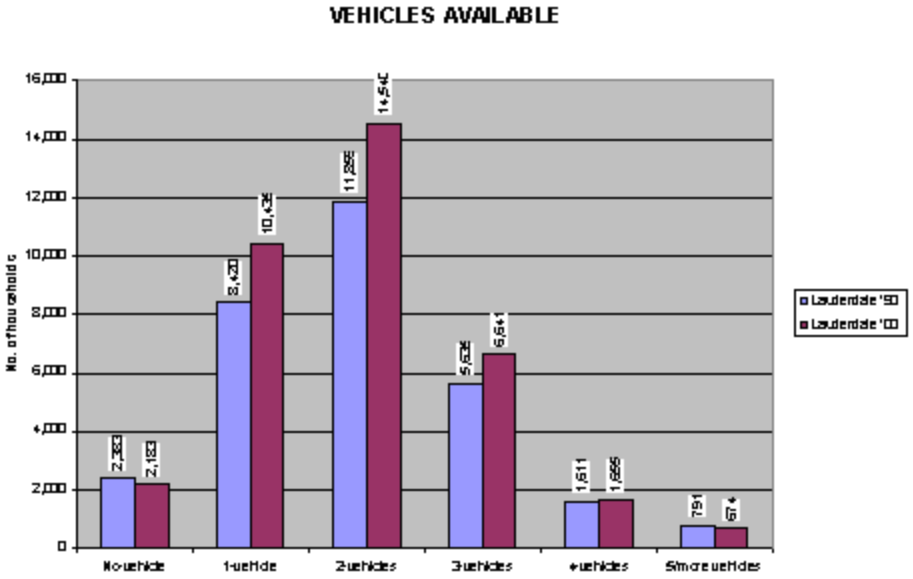

Figure B-18. Vehicles available per household in Lauderdale county

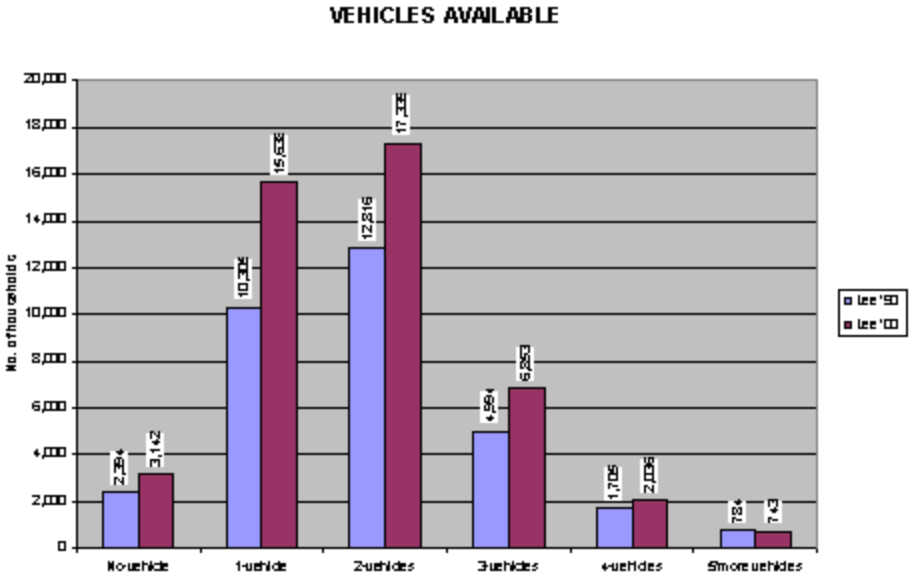

Figure B-19. Vehicles available per household in Lee county

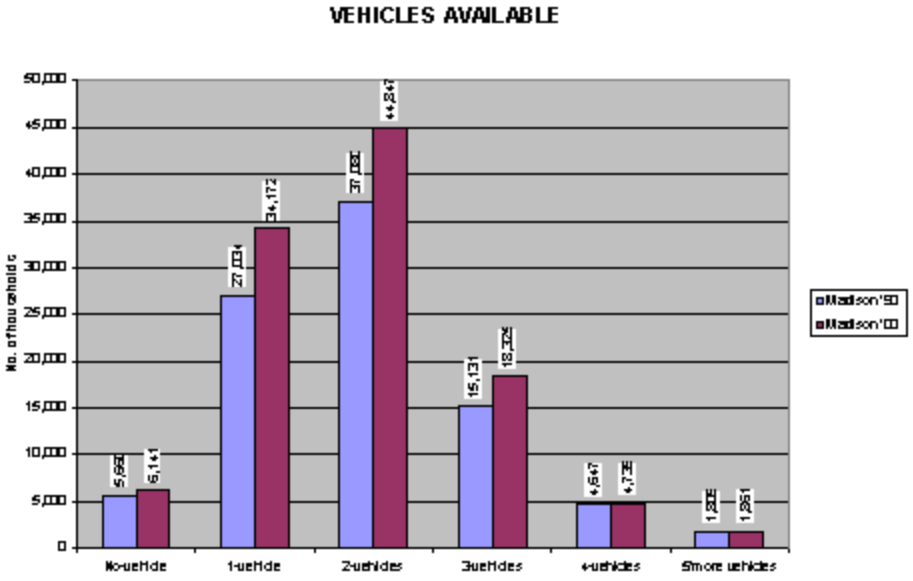

Figure B-20. Vehicles available per household in Madison county

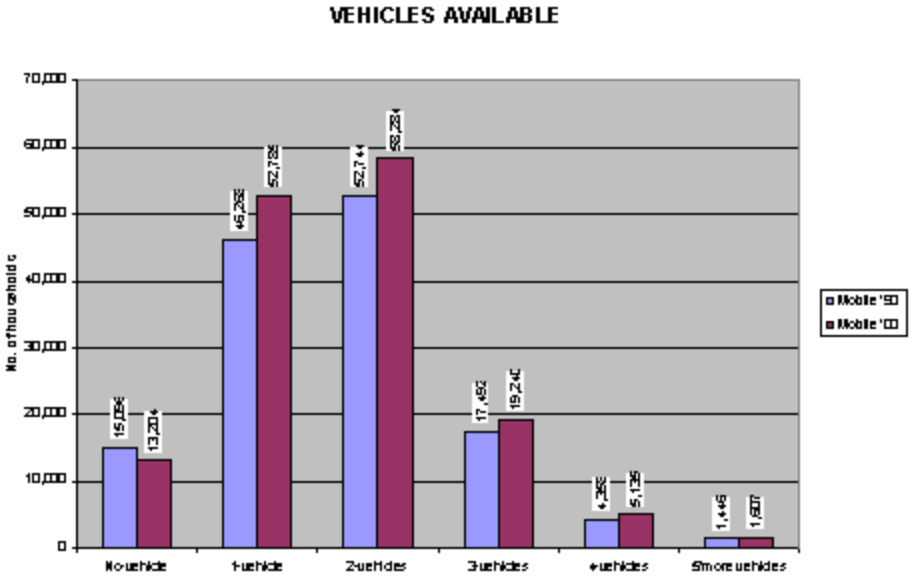

Figure B-21. Vehicles available per household in Mobile county

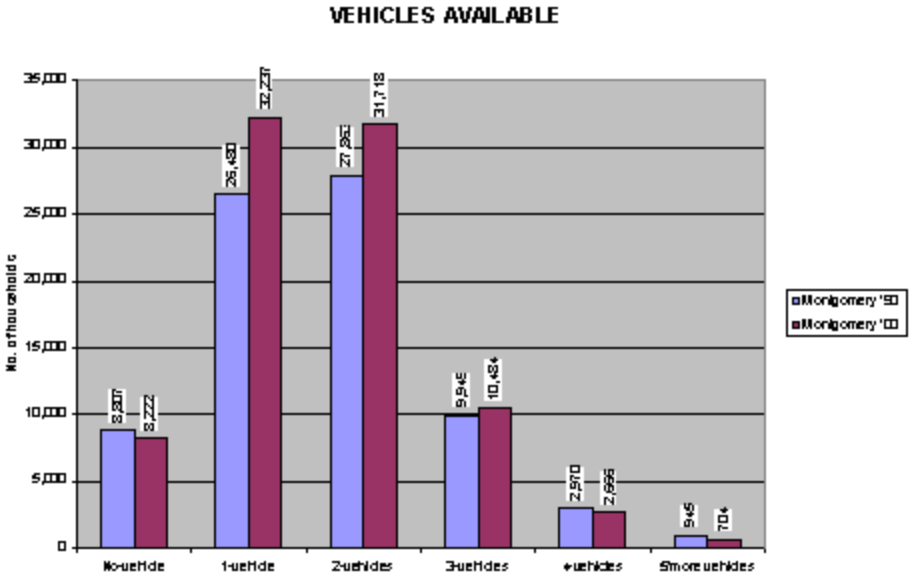

Figure B-22. Vehicles available per household in Montgomery county

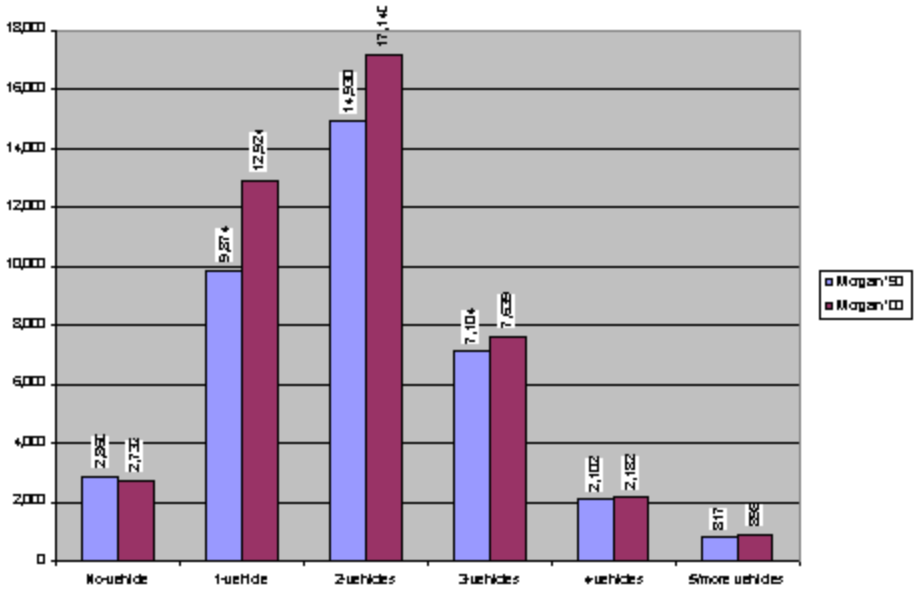

Figure B-23. Vehicles available per household in Morgan county

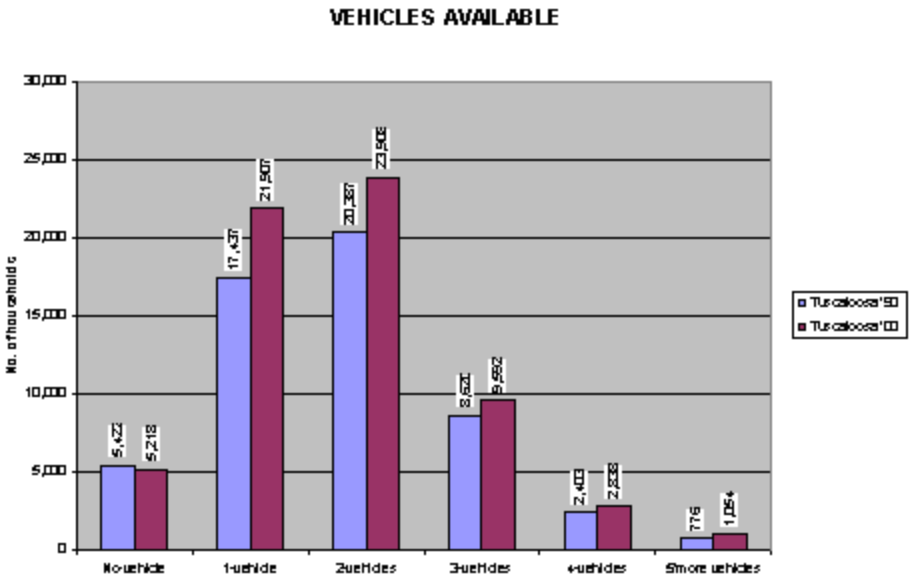

Figure B-24. Vehicles available per household in Tuscaloosa county

Income

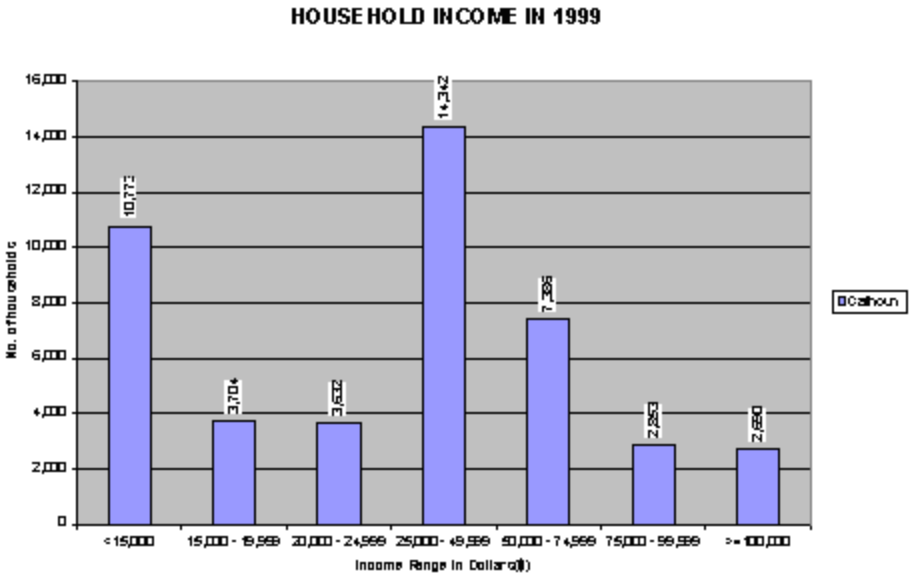

Figure B-25. Household income distribution in Calhoun county

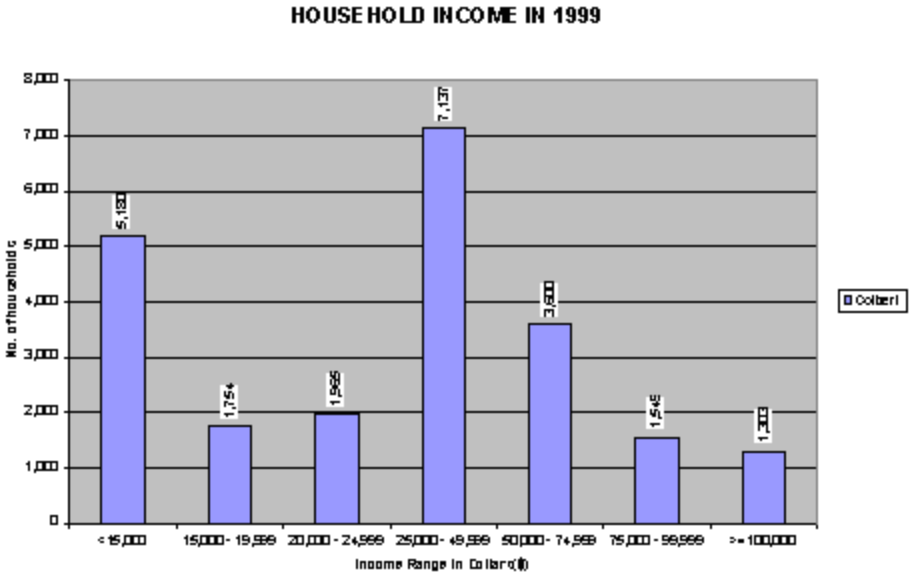

Figure B-26. Household income distribution in Colbert county

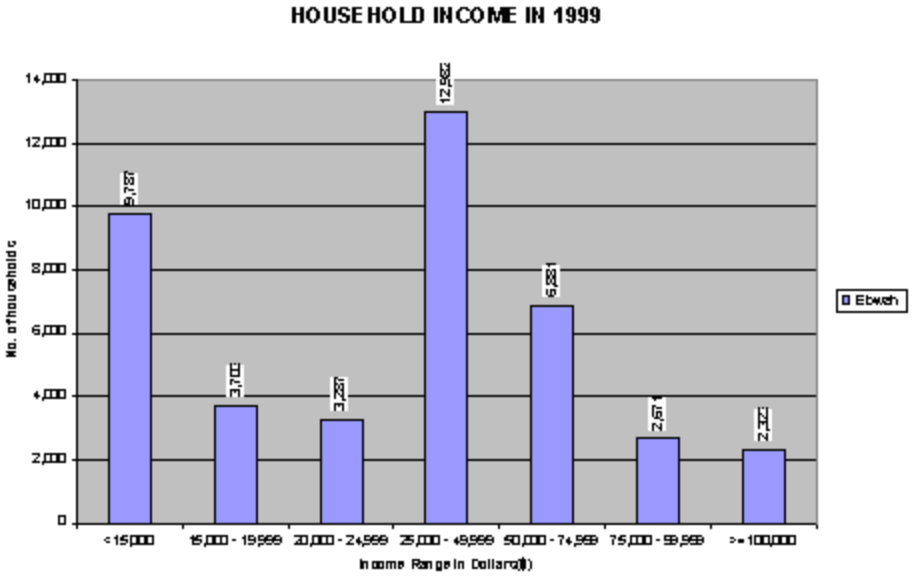

Figure B-27. Household income distribution in Etowah county

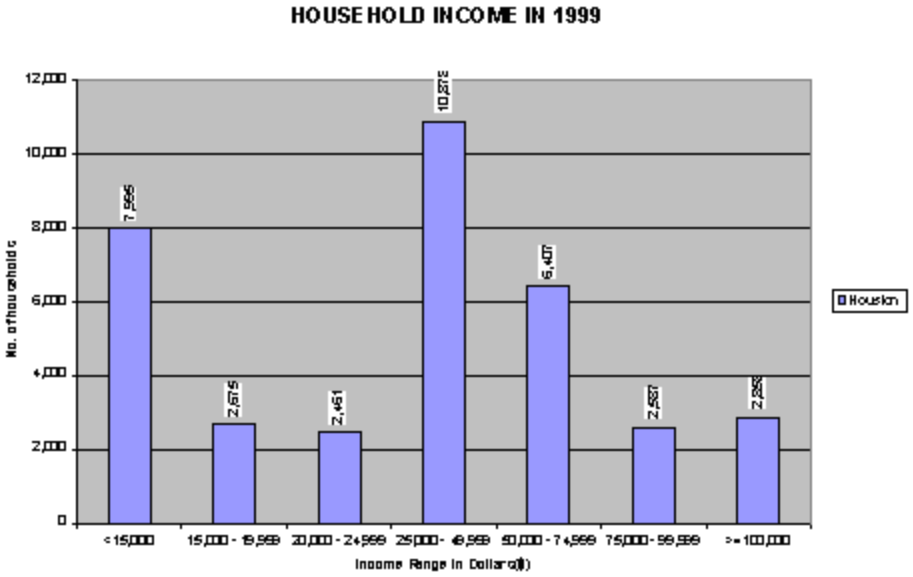

Figure B-28. Household income distribution in Houston county

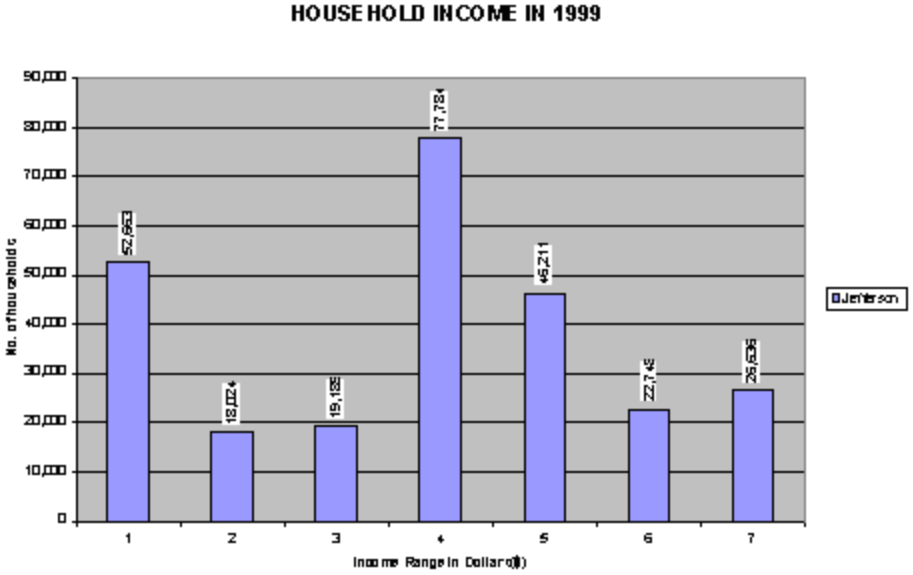

Figure B-29. Household income distribution in Jefferson county

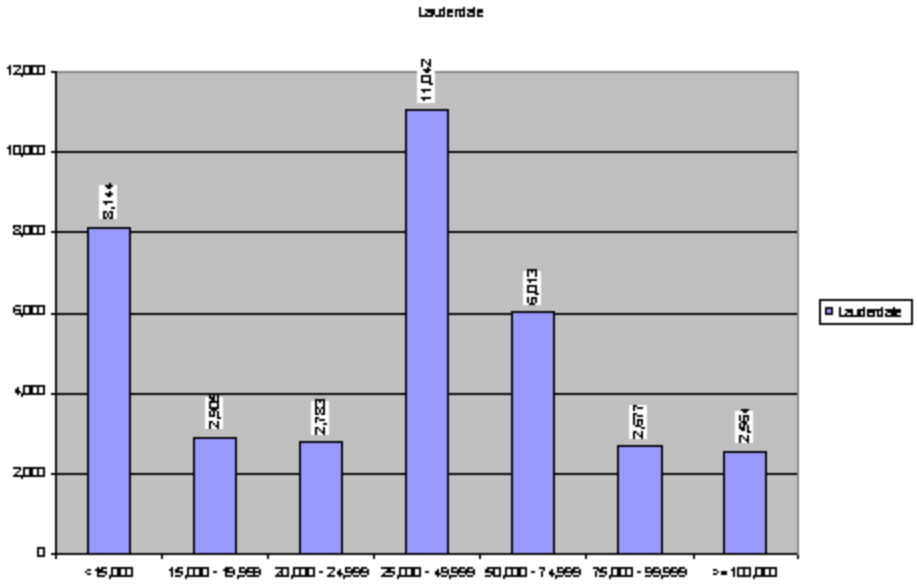

Figure B-30. Household income distribution in Lauderdale county

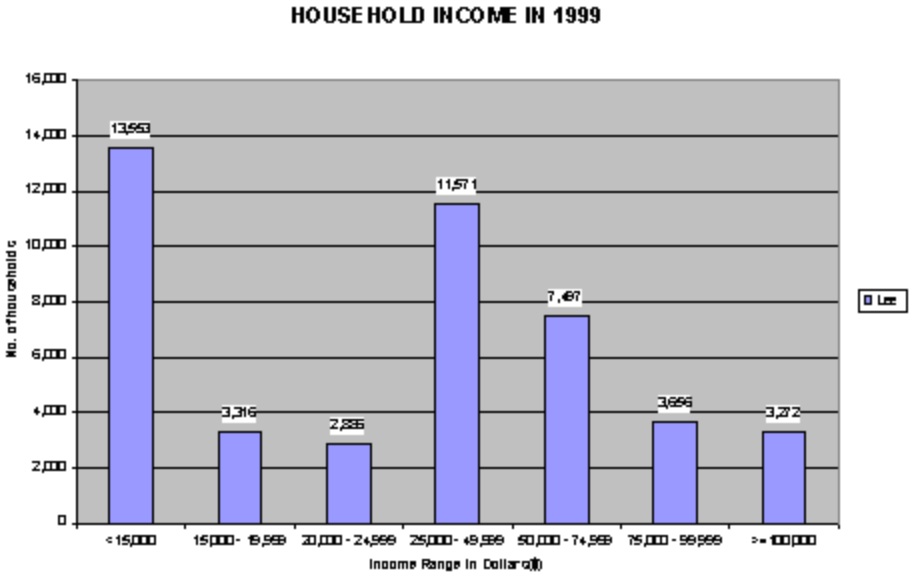

Figure B-31. Household income distribution in Lee county

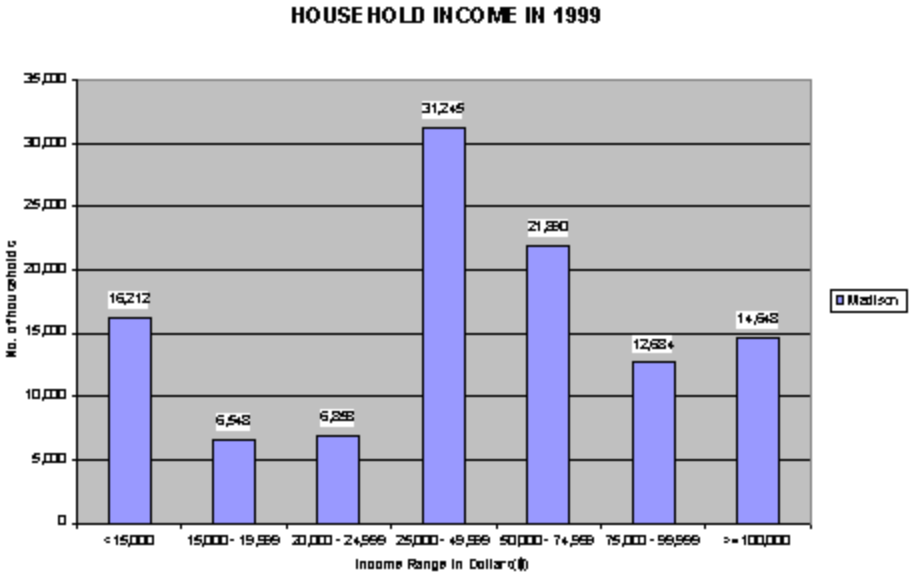

Figure B-32. Household income distribution in Madison county

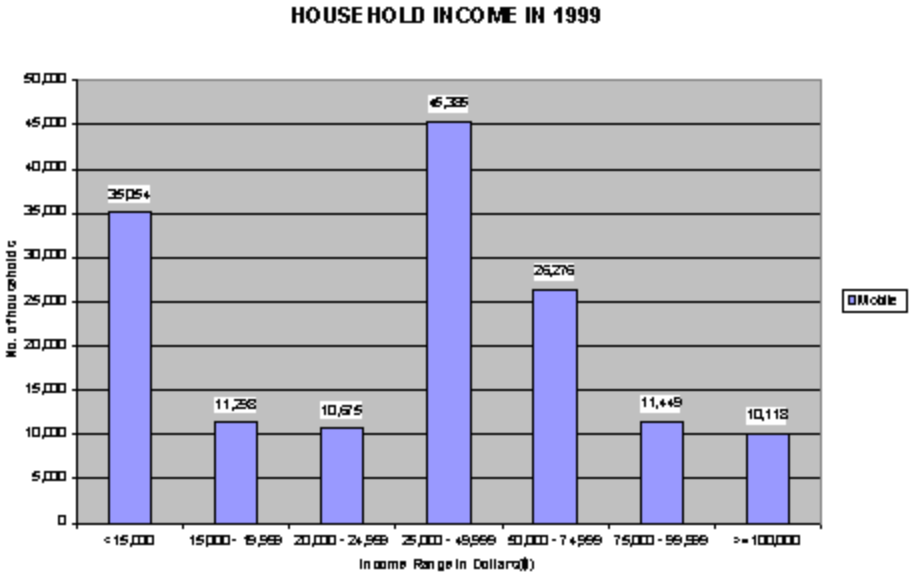

Figure B-33. Household income distribution in Mobile county

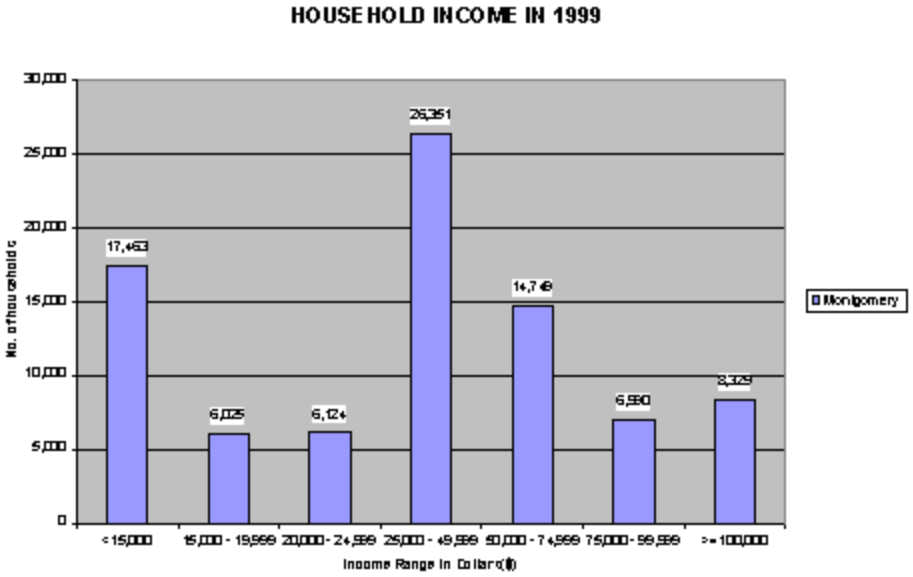

Figure B-34. Household income distribution in Montgomery county

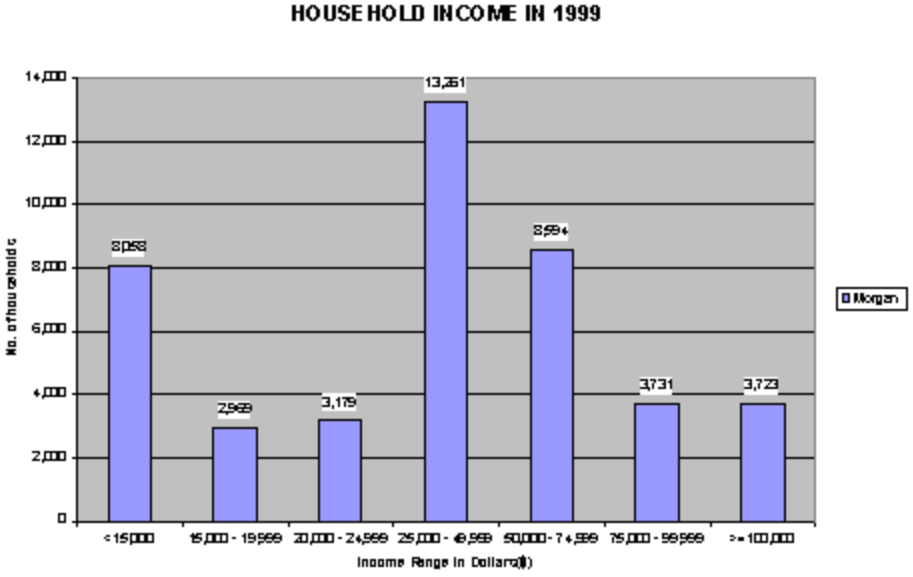

Figure B-35. Household income distribution in Morgan county

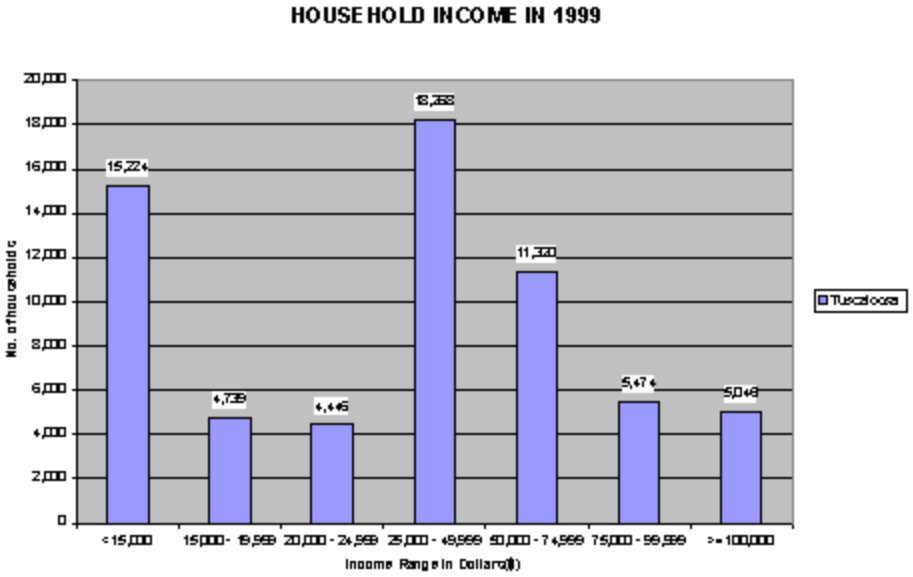

Figure B-36. Household income distribution in Tuscaloosa county

Travel Time to Work

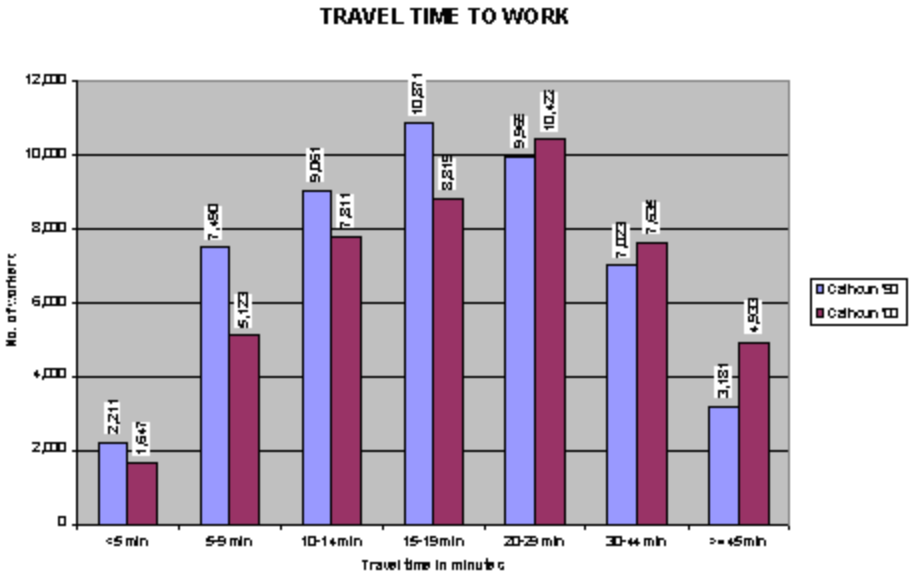

Figure B-37. Work commute travel time distribution in Calhoun county

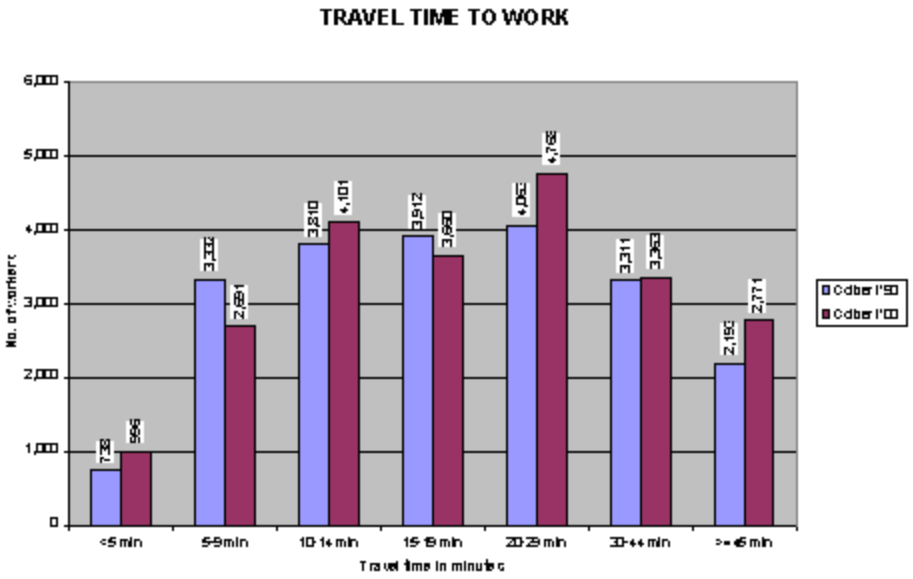

Figure B-38. Work commute travel time distribution in Colbert county

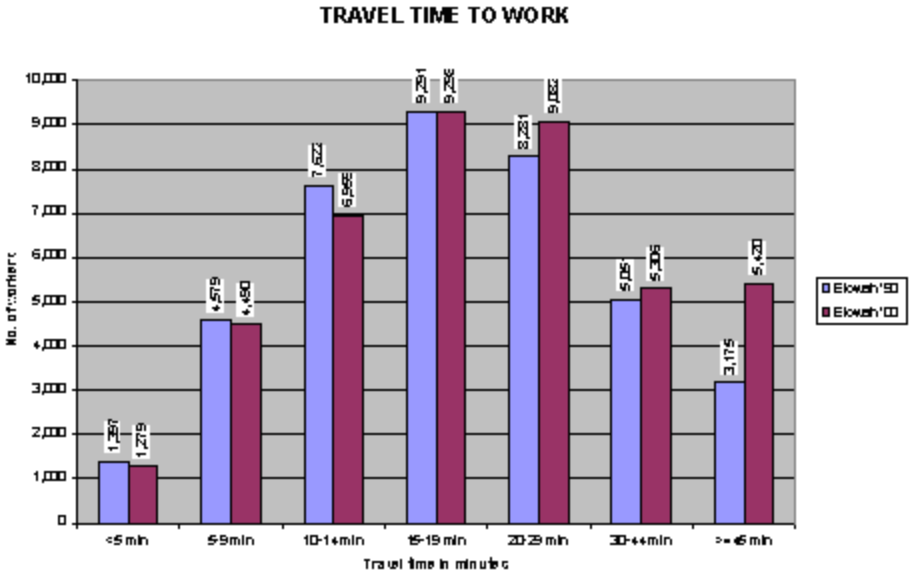

Figure B-39. Work commute travel time distribution in Etowah county

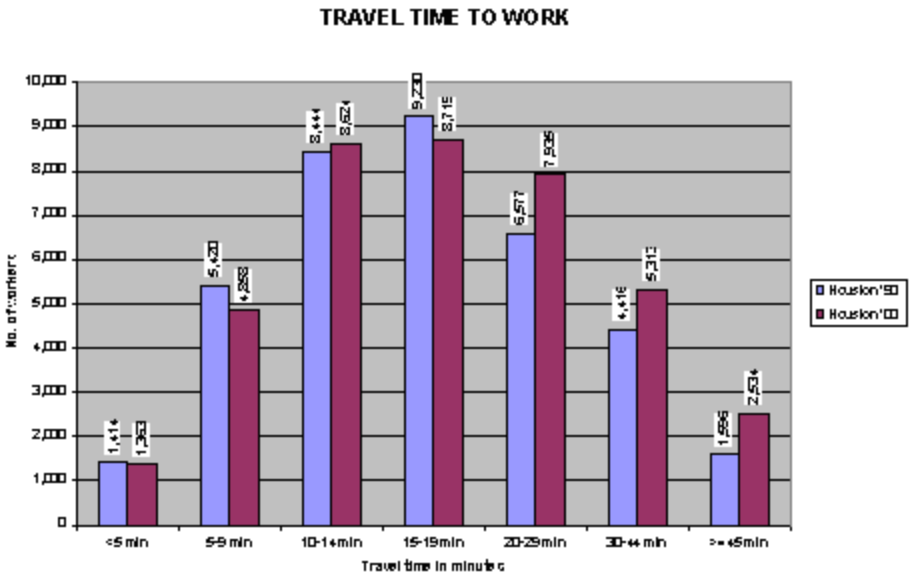

Figure B-40. Work commute travel time distribution in Houston county

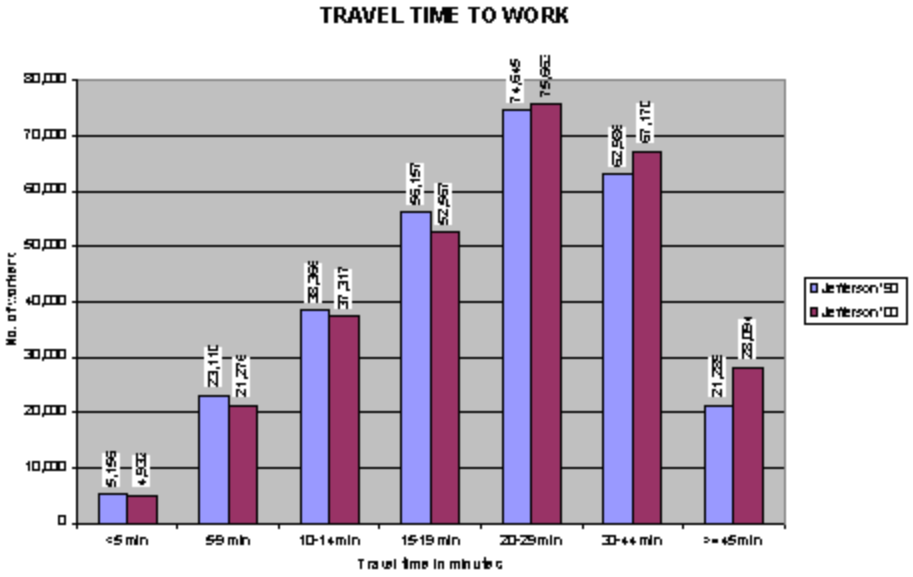

Figure B-41. Work commute travel time distribution in Jefferson county

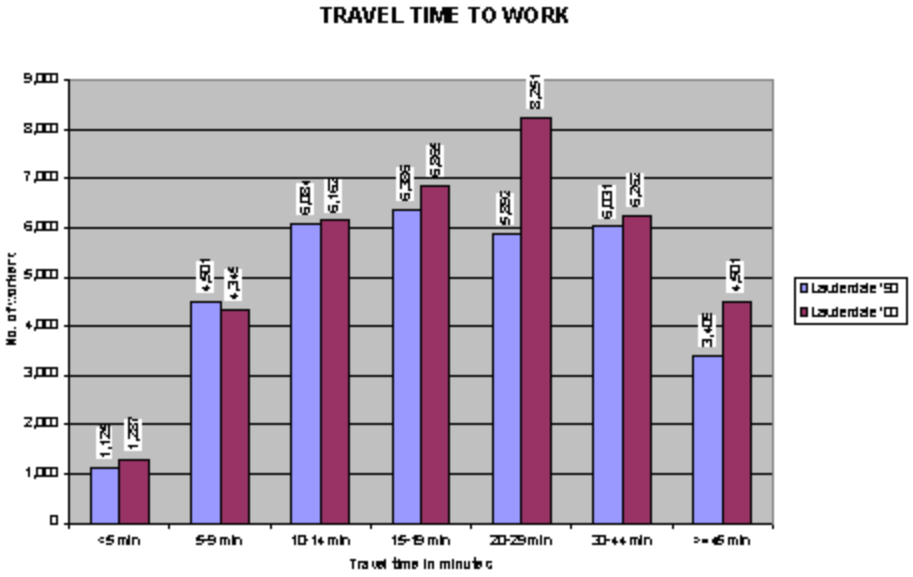

Figure B-42. Work commute travel time distribution in Lauderdale county

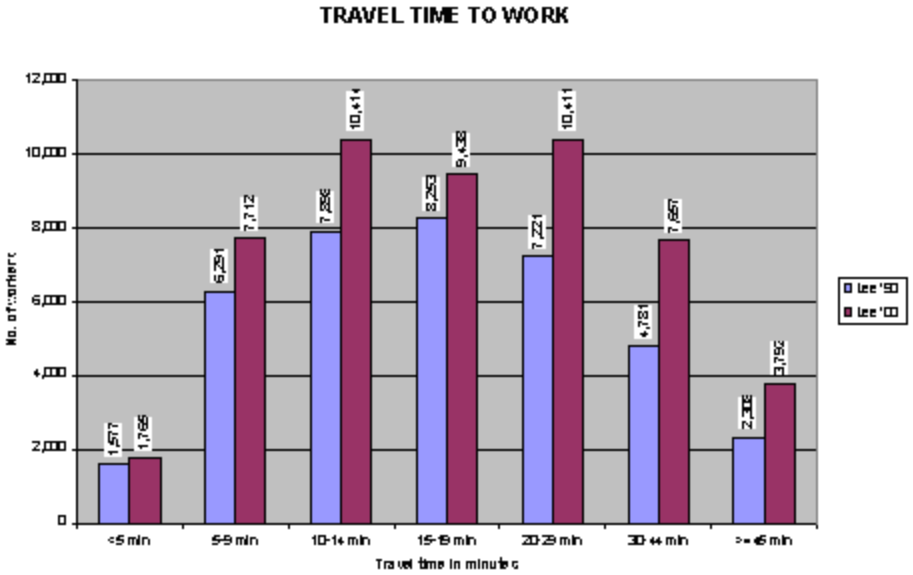

Figure B-43. Work commute travel time distribution in Lee county

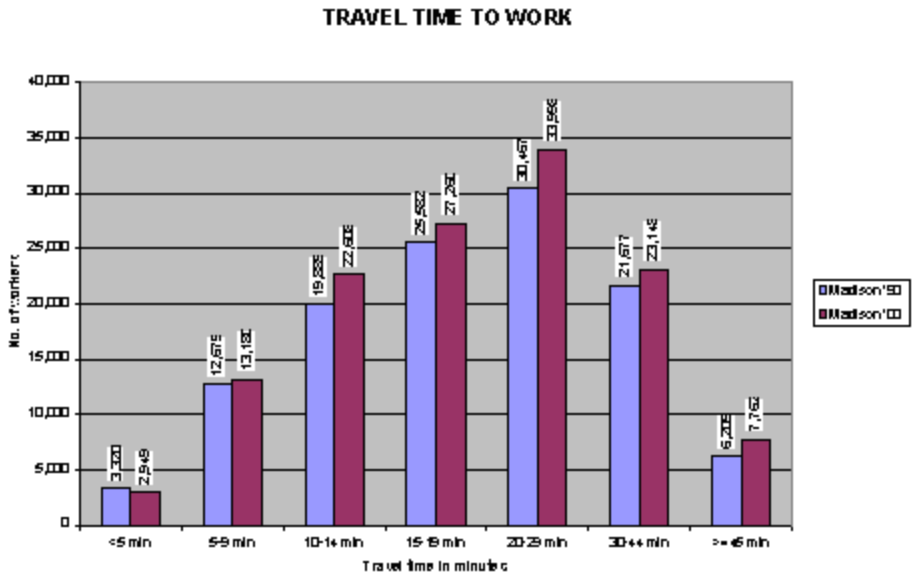

Figure B-44. Work commute travel time distribution in Madison county

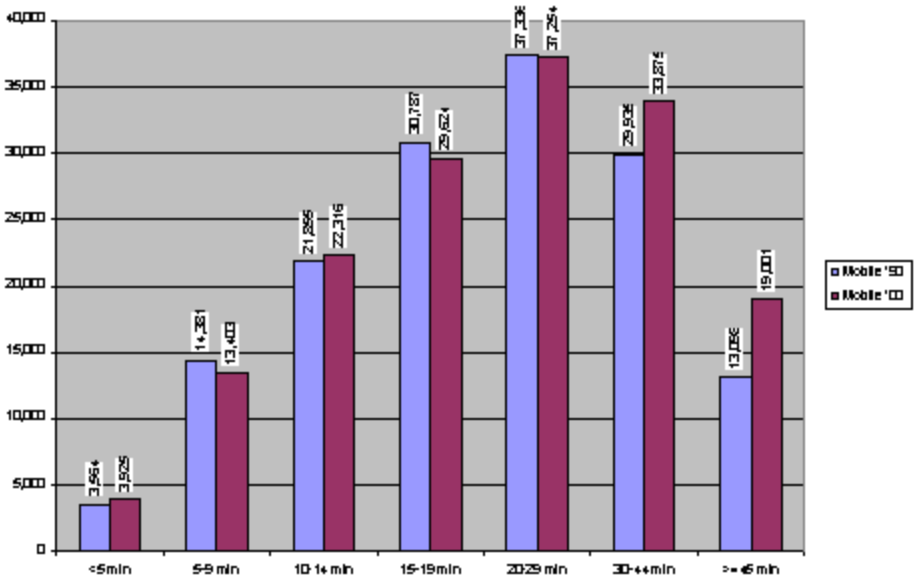

Figure B-45. Work commute travel time distribution in Mobile county

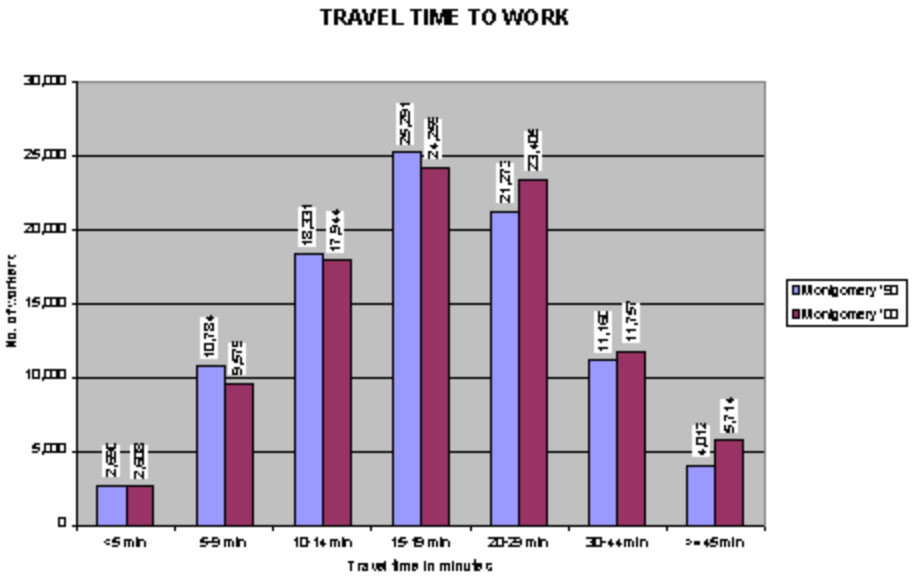

Figure B-46. Work commute travel time distribution in Montgomery county

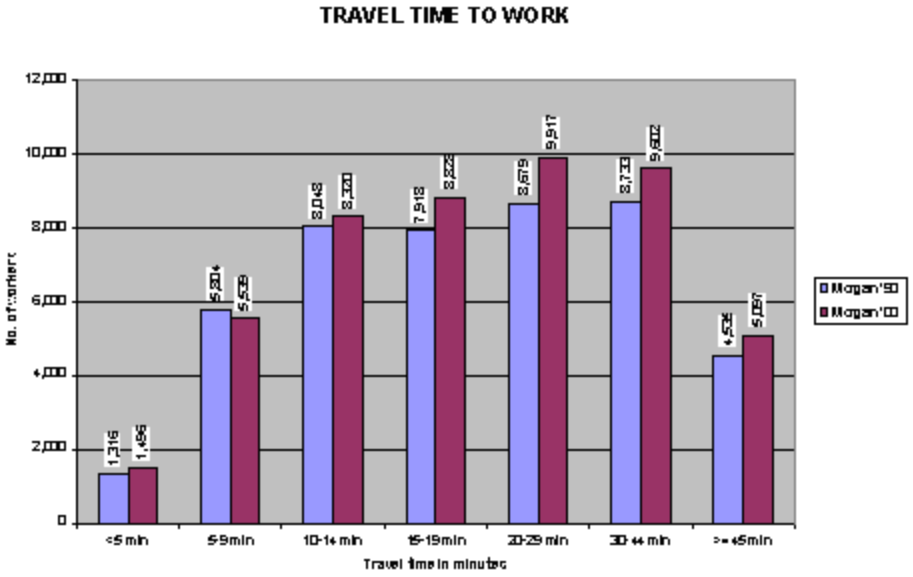

Figure B-47. Work commute travel time distribution in Morgan county

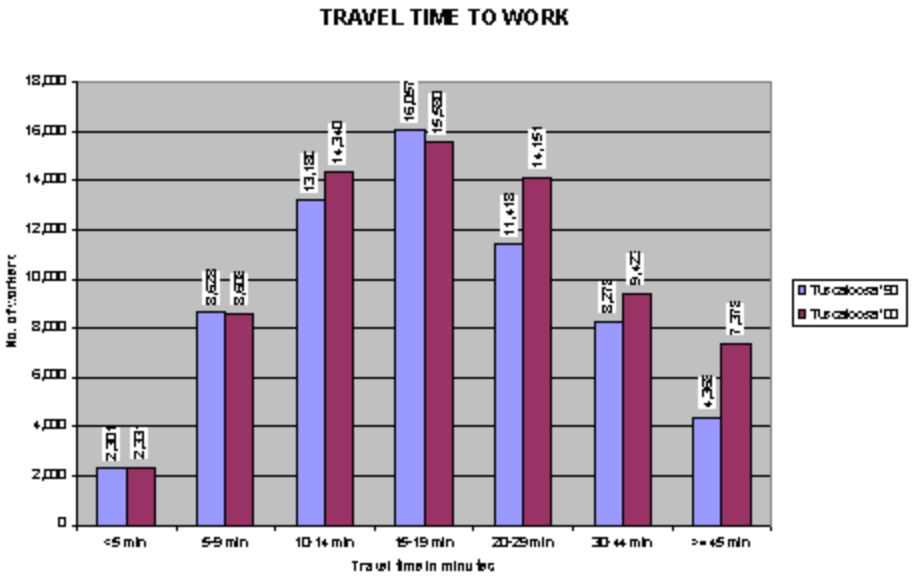

Figure B-48. Work commute travel time distribution in Tuscaloosa county

Mode to Work

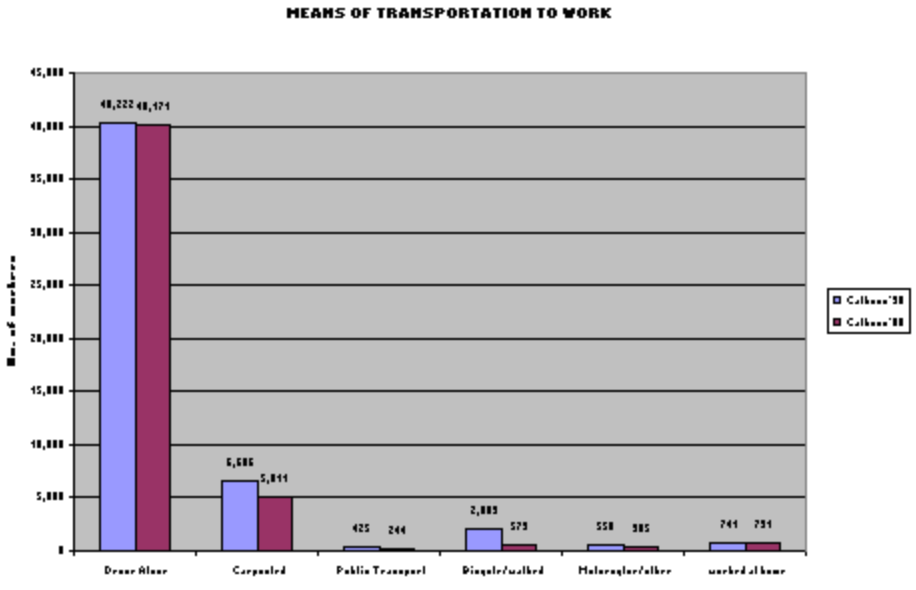

Figure B-49. Work commute mode distribution in Calhoun county

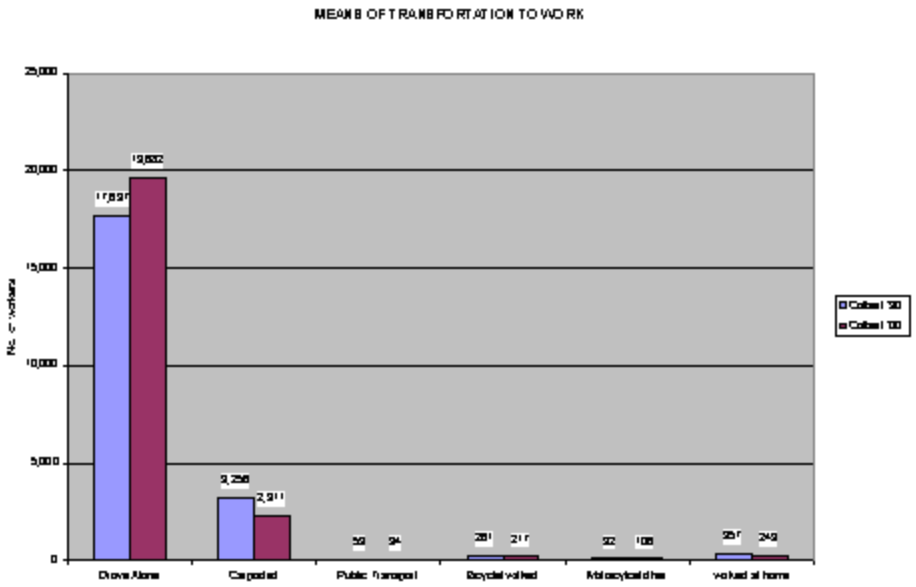

Figure B-50. Work commute mode distribution in Colbert county

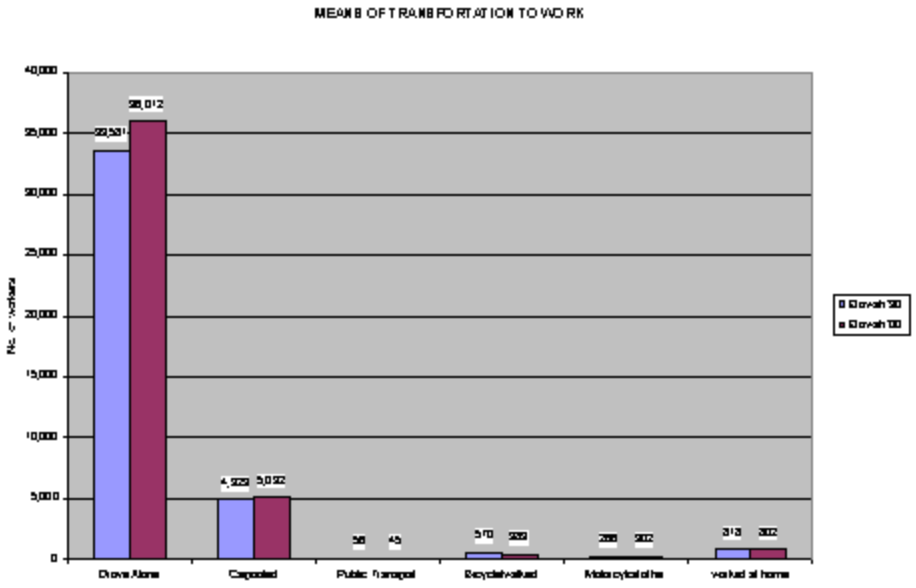

Figure B-51. Work commute mode distribution in Etowah county

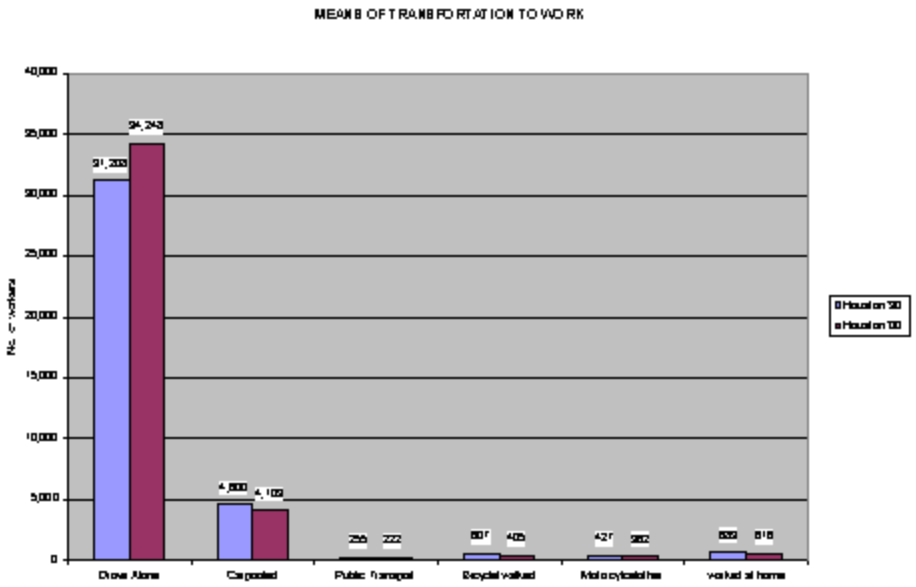

Figure B-52. Work commute mode distribution in Houston county

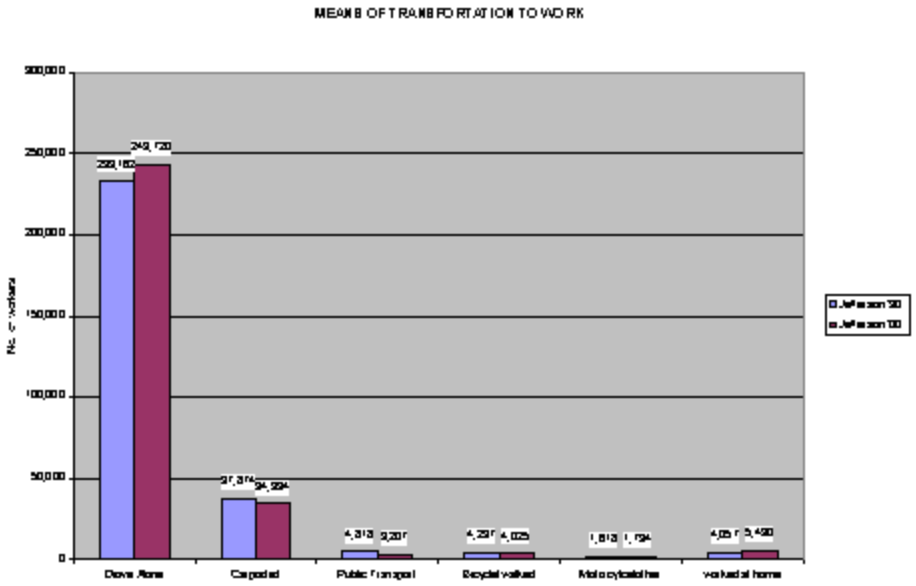

Figure B-53. Work commute mode distribution in Jefferson county

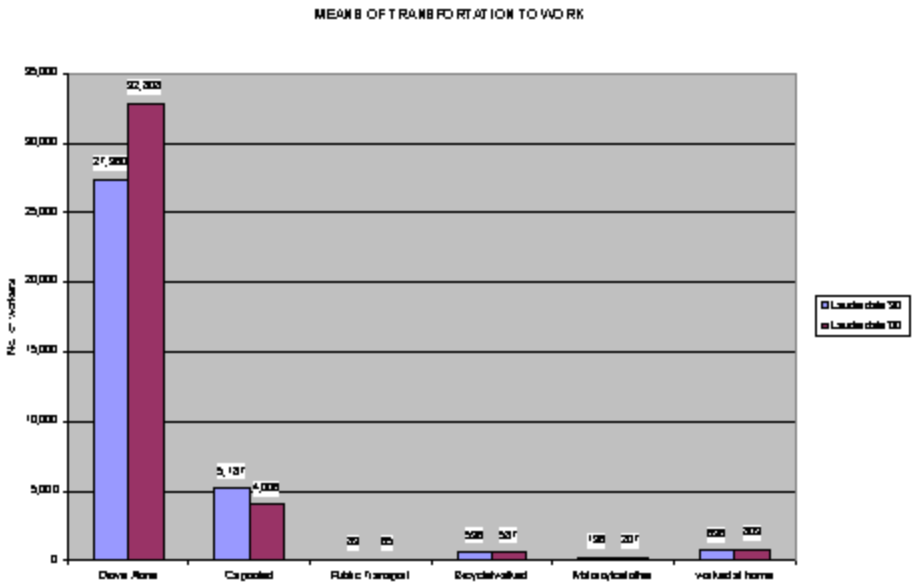

Figure B-54. Work commute mode distribution in Lauderdale county

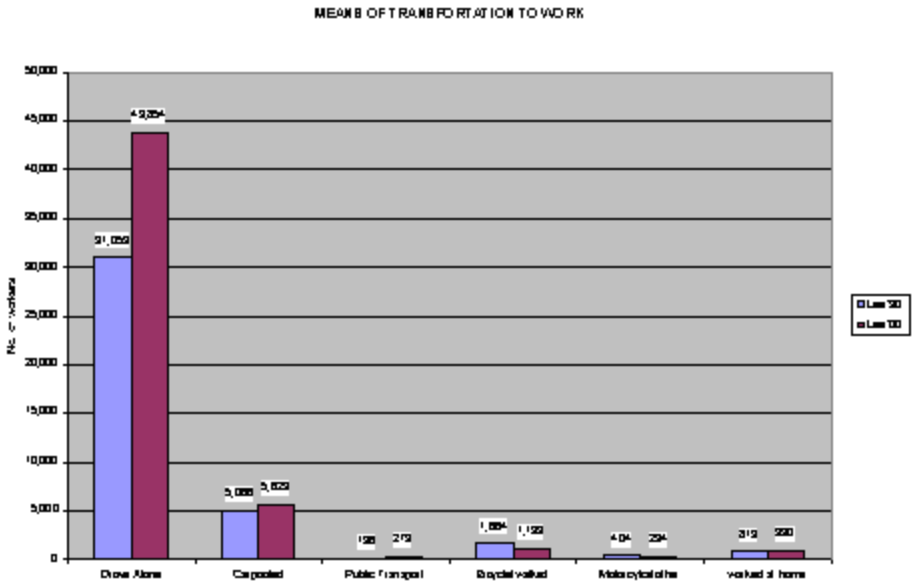

Figure B-55. Work commute mode distribution in Lee county

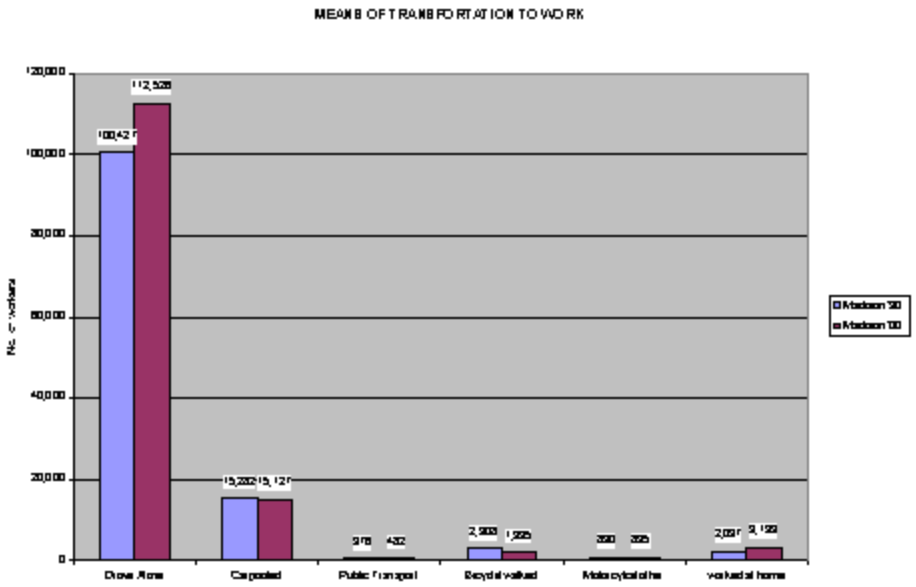

Figure B-56. Work commute mode distribution in Madison county

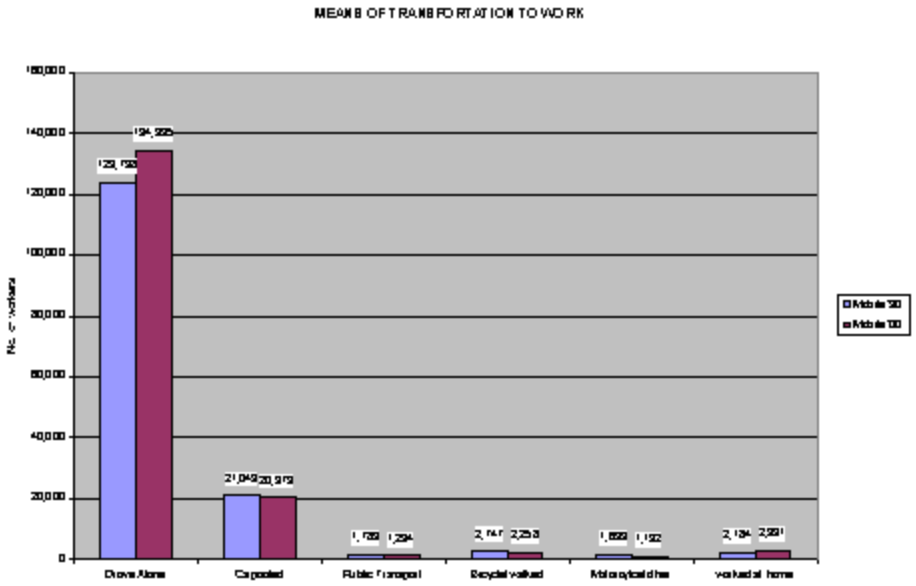

Figure B-57. Work commute mode distribution in Mobile county

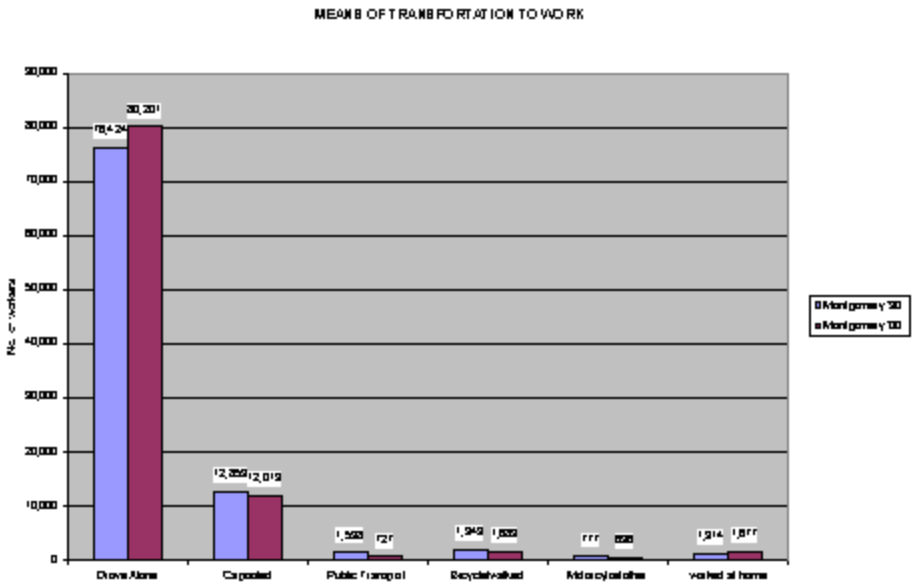

Figure B-58. Work commute mode distribution in Montgomery county

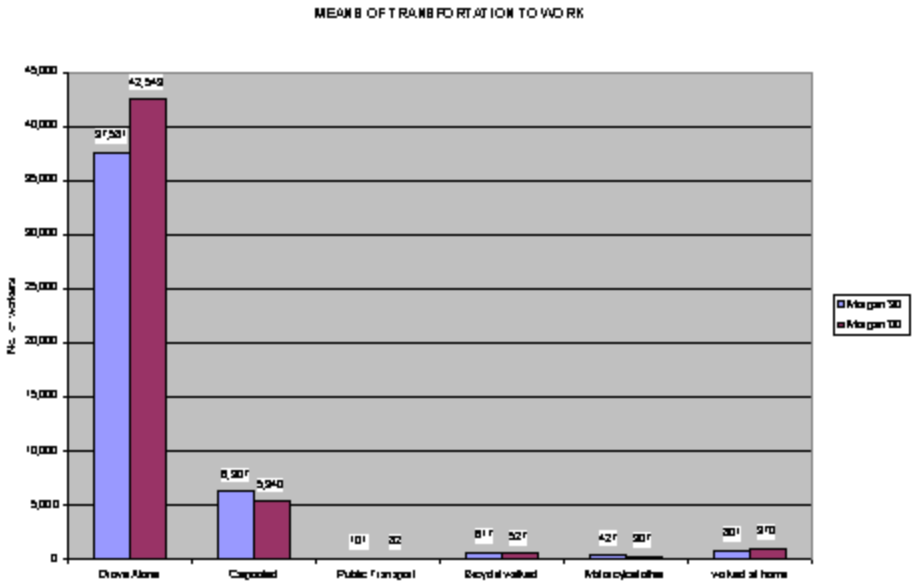

Figure B-59. Work commute mode distribution in Morgan county

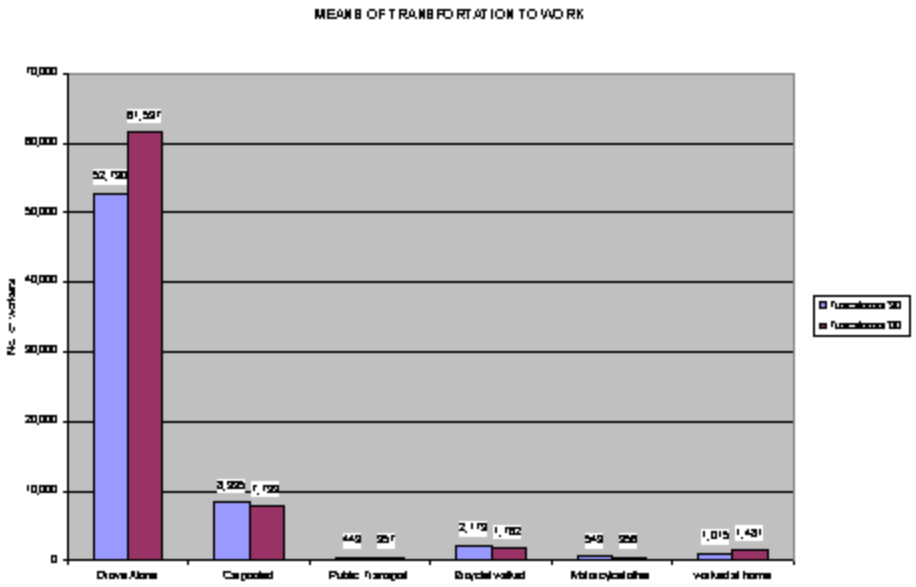

Figure B-60. Work commute mode distribution in Tuscaloosa county