STUDENT TRANSPORTATION BENCHMARKING SURVEY

Michigan School Business Officials

in conjunction with

Management Partnership Services, Inc.

June 2007

Table of Contents

Introduction 1
  Survey Results 2
  Structure of Report 3
  Use of Results 3
Financial Analysis 6
  Cost Per Student 6
  Cost Per Bus 7
  Cost Per Mile 9
  Additional Measures for Consideration 11
Transportation Operations 13
  Buses Used to Transport 100 Students 13
  Runs Per Bus 14
  Simple Capacity Utilization 15
  Percentage of Special Education Students Transported 17
  Additional Measures for Consideration 17
Fleet Maintenance and Management 19
  Buses per Technician 19
  Vehicle equivalent units per technician 20
  Fleet Age and Mileage 22
  Additional Measures for Consideration 23
Appendix 1 – Regional Groupings of Intermediate School Districts 24

Table of Figures

Figure 1: Fleet Size of Survey Respondents 2
Figure 2: Median Cost per Student Transported by Region 7
Figure 3: Average and Median Cost Per Bus by Region 9
Figure 4: Average and Median Cost Per Mile 10
Figure 5: Average and Median Cost Per Mile by Region 11
Figure 6: Simple Capacity Utilization by Number of Students Transported 16
Figure 7: Simple Capacity Utilization by Fleet Size 16
Figure 8: Average Percentage of Special Education Students Transported 17
Figure 9: Buses per Technician by Fleet Size 20
Figure 10: Average Fleet Age Range 22
Figure 11: Average Fleet Mileage Range 23

Introduction

The following report summarizes the results of the first survey of student transportation operations conducted by the Michigan School Business Officials. The objective of the survey process is to develop a select series of highly relevant and meaningful performance statistics that can be used to quantify the performance of individual transportation programs and define the basis for subsequent operational improvements. The results of the survey process will also allow transportation managers, business administrators, and other stakeholder groups to identify areas of particularly strong performance. The results can also help identify specific aspects of the operation that may require attention. Finally, an effective performance measurement program will allow both transportation professionals and school administrators to better understand the underlying factors that impact the cost and service quality of their transportation program, and how planned changes to district policies or education programs may influence these performance factors in the future.

The specific objectives of the survey process include:

1. Define a series of highly relevant indicators of operational performance.
2. Develop a mechanism whereby districts will be able to compare their performance internally and to comparable districts across the state.
3. Improve the use of quantitative analysis to improve operational performance.
4. Identify best management practices through analysis and interpretation of survey results.
5. Establish a mechanism to evaluate the impact of changes in policies or practices on transportation efficiency and cost effectiveness.

The inherent complexity of transportation operations, including the effect of topography, student density, traffic, school locations and bell times, requires a structured analytical approach to understand the performance of an operation. The empirical data available in modern accounting, fleet management, and routing software, permits transportation cost and quality to be measured more efficiently and effectively than ever before. Consistent use and analysis of performance measurement data allows school boards, superintendents, business managers, and transportation managers to spot important trends that may indicate whether or not further scrutiny and management controls are warranted.

The survey was conducted in conjunction with the Michigan Department of Education and Management Partnership Services, Inc.

Survey Results

The results of this survey were derived from two primary data sources:

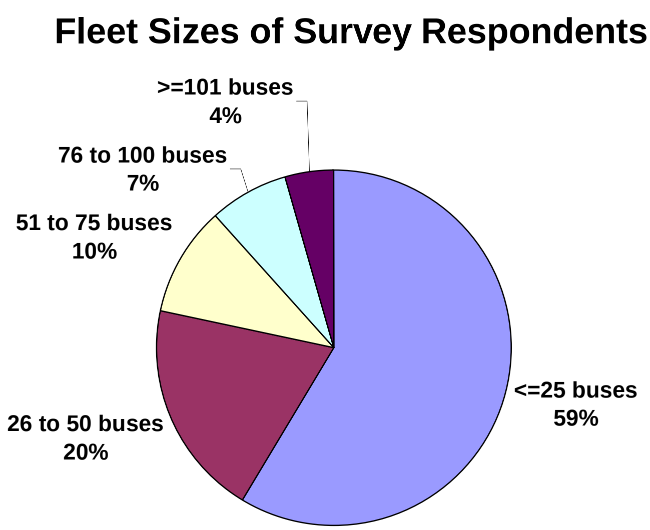
- The 2005 – 2006 SE-4094
- The Transportation Benchmarking Survey

The SE-4094 is submitted annually by school districts across Michigan. It includes data on transportation costs, service volumes (number of buses, total miles traveled, and students transported), and personnel data. The transportation survey was conducted in February and March 2007 and collected operational data on the number of bus trips, fleet maintenance staffing, and service delivery type. All of the analyses presented below represent a blend of regular education and special education costs and resources requirements, except where noted.

Of the 611 districts who submitted results for the SE-4094, 173 (28 percent) responded to the survey. The 173 districts who responded represented nearly 45 percent of all buses driven across the state and 47 percent of total students transported. Over 85 percent of the respondents represented district owned and operated transportation programs and most of these programs were fewer than 25 buses. Overall, the "typical" district that responded to the survey was a district operated transportation program utilizing approximately 30 buses in a single bell system that traveled approximately 250,000 miles per year and utilized one technician for maintenance.

Figure 1 below compares the fleet size of survey respondents relative to statewide totals.

Figure 1: Fleet Size of Survey Respondents



Structure of Report

The results of the survey are separated into three primary groups of measures:

- Financial analysis – these are measures related to the costs of transportation services. Measures calculated include:
  - Cost per student transported
  - Cost per bus
  - Cost per mile
- Transportation operations – these measures focus on routing and scheduling related measures that can be used to evaluate the efficiency and effectiveness of routing schemes. Measures calculated include:
  - Buses per 100 students
  - Runs per bus
  - Simple capacity utilization
  - Percentage of special education students
- Fleet-related - these measures allow for analysis of fleet maintenance staffing and maintenance demand. Measures include:
  - Buses per technician
  - Vehicle equivalent units per technician
  - Fleet age and mileage

Use of Results

Throughout this report two primary metrics have been calculated for virtually all measures. The first metric is the average value. The average represents the arithmetic mean of all values in the set. This value is very sensitive to the influence of very large or very small relative values in the set and would, if looked at in isolation, provide an incomplete and potentially inaccurate perception of performance in the specific areas. Therefore, we have also calculated a median value for all measures where the data provided allowed us to do this. The median represents the point where exactly half of the values in the set would be smaller and half would be larger than this value. The median is not impacted by the extremely large or small values in the set and presents a reasonable representation of the "average" value of a group of data, provided that most of the values are clustered around the median. Both measures are provided to allow districts multiple points of comparison for use in evaluating their operations.

While a quantitative approach to reviewing performance is efficient and revealing, there are a number of inherent limitations that must be considered. These include:

- Data Quality – The results achieved are only as accurate and complete as the quality of the source data. There are certain inconsistencies in both 4094 and survey data that influence results but do not invalidate them. However, all uses of the data should take this factor into account.

- Qualitative Factors Affecting Performance – Calculating quantitative measures of performance generally only provides a starting point in analyzing performance. All information and conclusions should be considered in the context of the specific operational requirements and constraints faced by a school district. While some of these factors can be quantified, other important, albeit subjective areas, such as extra accommodations for special education students beyond those required for transportation, need to be considered as well.

- Performance Trends – The analysis presented in this document provides a "snapshot" view of performance at a specific point in time. It is equally important to track trends in performance over time in order to determine whether decisions made are having the desired effect, and to avoid misinterpreting a one-time calculation. However, developing a comprehensive history of performance trends will require implementation of many of the recommendations presented in this report to provide the data necessary to perform the desired calculations.

- Service Delivery Approach – Because different, but equally valid, approaches to providing student transportation services are found in many school districts, quantitative metrics do not provide the only true and accurate measure of performance without a thorough understanding of how the various approaches to service delivery will affect the quantitative comparison.

Despite these cautions, the results of the survey will be useful to everyone who is interested in analyzing transportation performance. In order to receive the most value from the survey results, a multi-step analytical process should be followed. The seven steps in the process are described briefly below:

1. **Calculate** – use the description of the measures provided to calculate your districts measures of performance.
2. **Compare** - use your results to compare to fleets of similar size and districts of similar student counts. In addition you can compare your results to other districts in your ISD for many of these measures.
3. **Evaluate** – use the measures to ask questions about how you do business and why some measures may be higher or lower than comparative districts.
4. **Focus** - identify how changing your business practices can have a positive impact on your results.
5. **Develop standards** – use historical trend information and comparative results to establish goals and objectives for the changes.
6. **Develop processes and tools** – identify what elements of your operation will need to be changed and identify a reasonable time frame for the change. Establish timelines for completing the goals and objectives and assign responsibility and accountability for accomplishing them to specific personnel.

7. **Measure** – recalculate and reevaluate the impacts that your changes had. Were they positive? Were they negative? Were they what you expected? Use the results of this review to begin the process again.

A regular program of performance measurement is a key tool to continually improving the cost competitiveness and quality of service provided by any operation. The results of this survey can be a useful component to all school districts who have committed themselves to providing the best, most cost effective services to the students in their district.

Financial Analysis

The cost of providing transportation services is a regular and on-going concern for all school districts. The performance indicators provided in this section will allow for multiple points of comparison using the several different categories of observation. Additional measures for consideration are included at the end of the section.

Cost Per Student

All transportation operations are in the business of moving students to promote access to educational opportunities. Consequently, the calculation of the cost to transport a student becomes one of the most important measures for understanding the performance of a transportation operation. A total of 172 of 173 total survey respondents included sufficient data to calculate this measure.

Calculation

- Grand total of expenditures from the 4094 / Total number of riders reported on the 4094

The grand total was chosen because it represents a reasonable proxy for a full cost allocation of transportation costs. The expenditure totals from the 4094 include personnel costs (salary and benefits), repair and maintenance costs (parts, contracted repair services), fuel, bus insurance, and depreciation expenses.

Results

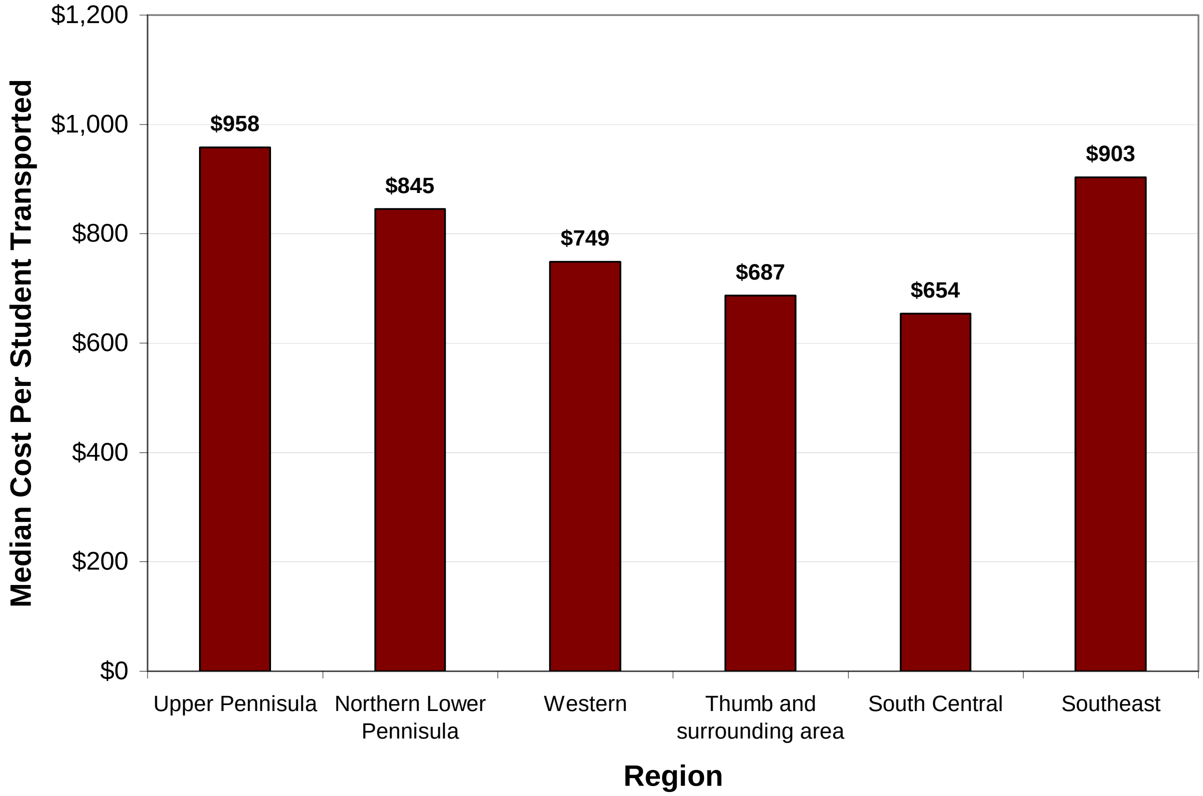
Table 1 below summarizes the results of an analysis of cost per student for the districts who responded to the transportation survey.

Table 1: Cost Per Student

Number of students transported	Respondent Count	Average Cost	Median Cost
<=1000	64	$966	$878
1,001 to 2,000	52	$722	$707
2,001 to 3,000	15	$777	$765
3,001 to 4,000	13	$813	$769
4,001 to 5,000	9	$673	$631
5,001 to 6,000	5	$935	$733
6,001 to 7,000	5	$971	$943
7,001 to 8,000	6	$798	$835
>=8,001	3	$580	$717
Overall	**172**	**$835**	**$771**

Table 1 indicates that the median cost per student of the survey respondents has a range of $313 per student from the lowest to the highest cost district. Figure 1 below compares the median cost per student transported by region[1].

Figure 2: Median Cost per Student Transported by Region



Cost Per Bus

Cost per bus is a useful indicator because it is generally the most appropriate measure to compare alternative service providers. When considering the outsourcing of transportation services, most requests for proposal and subsequent contracts will be based on a cost per bus per day. Multiplying the daily cost by the number of school days provides an annual cost per bus value, similar to the one presented below. The measure is calculated using available data from the SE-4094 for 172 of 173 total survey respondents.

Calculation

- Grand total of expenditures from the 4094 / Total number of insured buses reported on the 4094

[1] Regions were established through groupings of ISDs. See Appendix 1 for the specific ISDs included in each regional grouping.

The grand total was chosen because it represents a reasonable proxy for a full cost allocation of transportation costs. The expenditure totals from the 4094 include personnel costs (salary and benefits), repair and maintenance costs (parts, contracted repair services), fuel, bus insurance, and depreciation expenses.

The number of insured buses was chosen because it represented the most complete count of buses available from the data array. In the event that no buses were reported on the 4094 but bus counts were provided in the survey, the survey bus count was used to calculate the measure.

Results

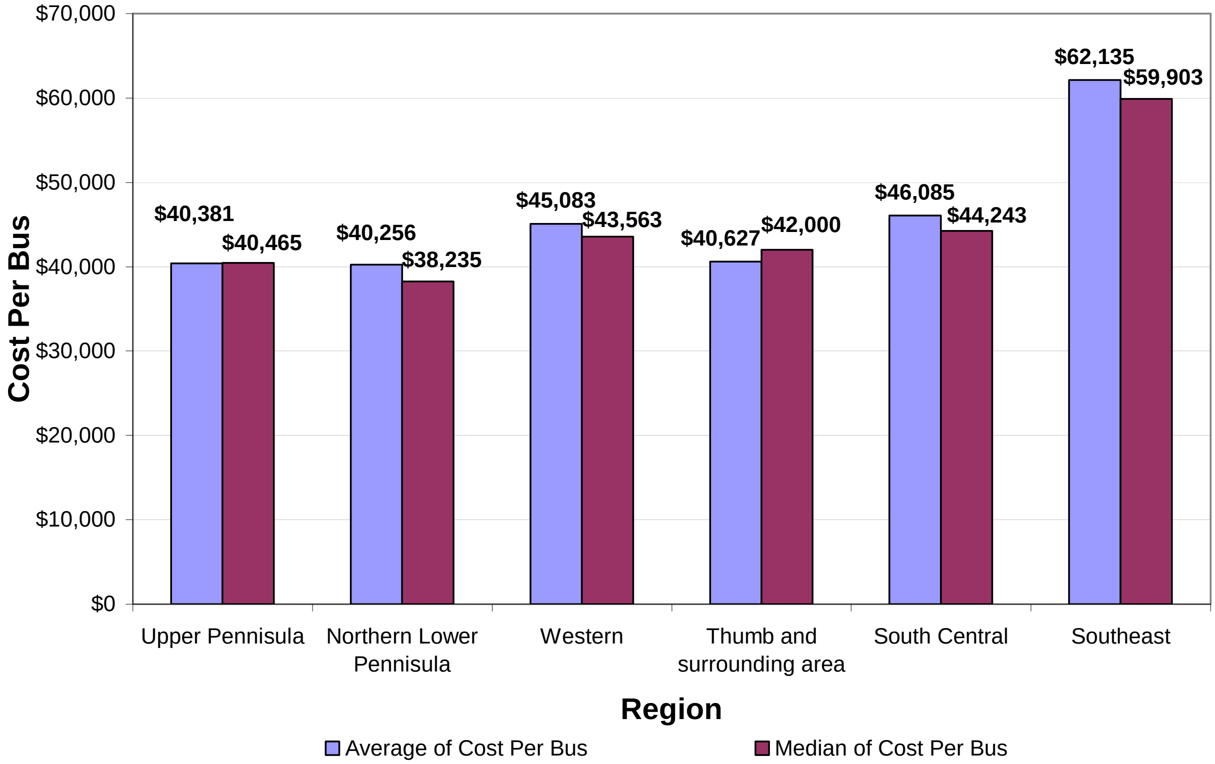
Table 2 indicates that districts with larger fleets incur higher average costs for transportation. In addition, there is a significant disparity between the average and median cost of the smallest and largest districts.

Table 2: Average and Median Cost per Bus by Fleet Size

Fleet Size	Count of Respondents		Average Cost	Median Cost
<= 25	102	59%	$44,634	$42,189
26 to 50	37	20%	$47,382	$45,255
51 to 75	18	10%	$55,340	$52,966
76 to 100	7	7%	$68,346	$70,202
>=101	8	4%	$62,449	$66,026
Overall	**172**		**$48,229**	**$44,716**

When analyzed on a regional basis, the results indicate that large urban districts in the southeast are significantly more expensive than other regions. This region contained six of the eight fleets over 100 buses in size who responded to the survey. However, all other regions have relatively similar costs. Figure 3 shows the average and median cost per bus by region.

Figure 3: Average and Median Cost Per Bus by Region



Cost Per Mile

Cost per mile is another comparative measure that can be used to evaluate the performance of an operation. The measure is calculated using available data from the SE-4094 for 172 of 173 total survey respondents.

Calculation

- Grand total of expenditures from the 4094 / Total miles traveled reported on the 4094

The grand total was chosen because it represents a reasonable proxy for a full cost allocation of transportation costs. The expenditure totals from the 4094 include personnel costs (salary and benefits), repair and maintenance costs (parts, contracted repair services), fuel, bus insurance, and depreciation expenses.

Results

Figure 4 below shows that as fleets travel a greater number of miles they display increasing per mile costs. Figure 4 also shows a relatively consistent cost for all districts until the 700,000 mile threshold when there is a significant increase in median cost per mile.

Figure 4: Average and Median Cost Per Mile

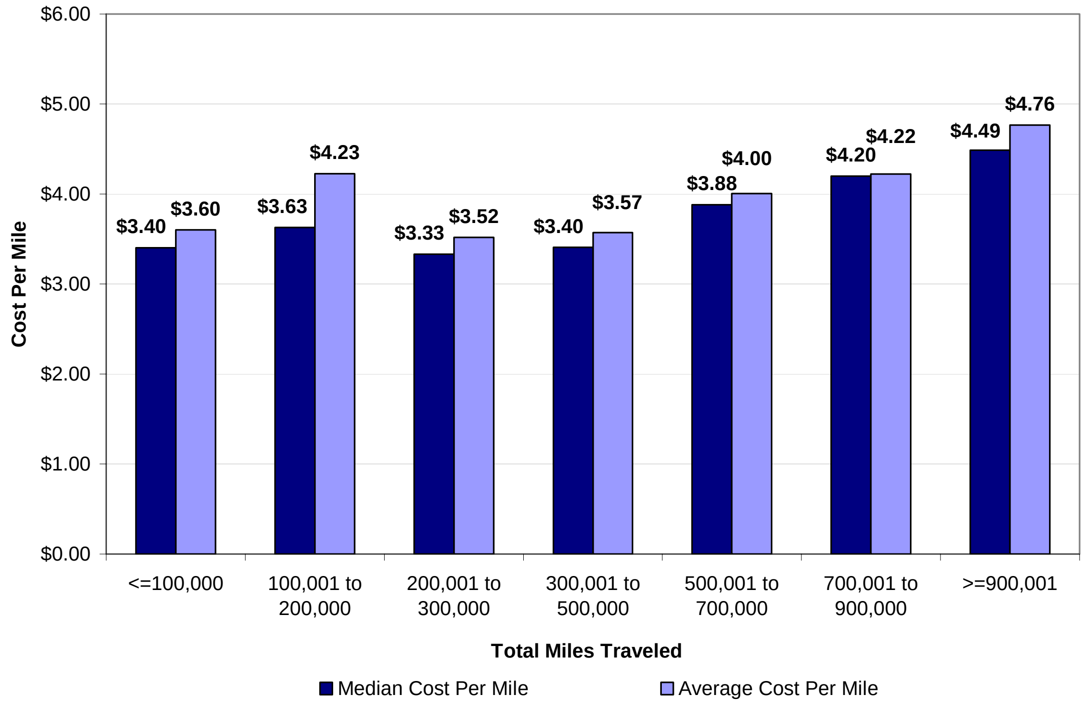
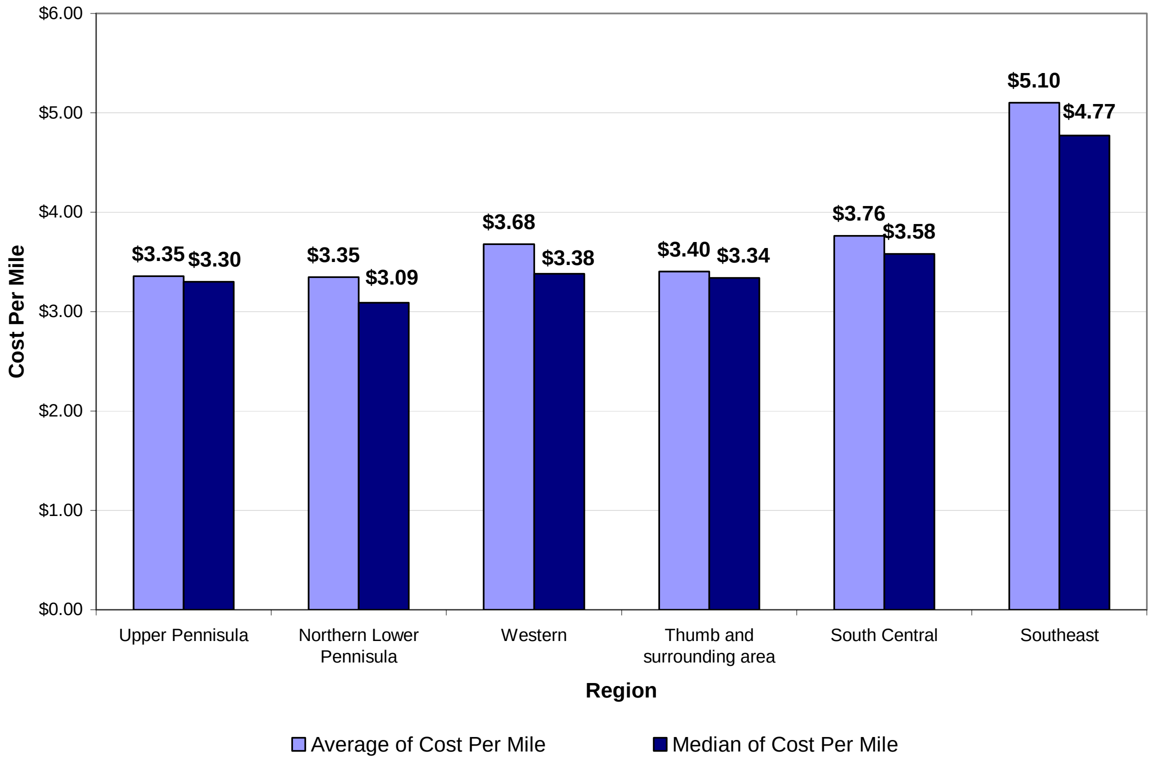


Figure 5 below shows average and median cost per mile by region. As with cost per bus, the cost per mile is generally consistent across the regions, again with the exception of the southeast area. As was mentioned, these districts have the largest fleets that travel the most number of miles.

Figure 5: Average and Median Cost Per Mile by Region



A significant contributing factor to the disparity in cost between fleets that travel the greatest number of miles (these are also predominantly in the southeast region) appears to be the cost of benefits to transportation staff. Based on the data available the median cost of benefits per district for the 29 districts that travel greater than 700,000 miles is $1.07 million while the median cost per district for benefits for the 142 districts that travel less than 700,000 miles is $168,000. While certainly not the only factor, this is clearly a contributing factor to the cost disparity between the two.

Additional Measures for Consideration

A more complete understanding of the cost competitiveness of transportation operations can be obtained from analysis of additional measures not presented here. These measures include:

- Cost per regular education student transported – This measure would require an allocation of costs between regular education transportation and other transportation related services. Total regular education transportation costs would be divided by the total number of regular education students transported.
- Cost per special education student transported - This is also a useful measure to understand the relative impact of each transportation service requirement by separating the cost of special education transportation from all other transportation services. An allocation of costs between special education transportation and other

transportation related services would be required. To calculate cost per special education student, the total cost of providing special education transportation would be divided by the total number of special education students transported.

- Cost per trip – This measure is useful to evaluate the costs of field and athletic trips and their impact on overall costs. Calculating this measure would begin with a cost allocation that segregates all field and/or athletic trip costs from other transportation-related costs and then dividing this total by the total number of trips taken. This measure can then be used to evaluate the appropriateness of any cost recovery rate used for extra curricular trips.
- Salary cost, benefit cost, and operational cost proportion – subtotaling costs in established categories and then dividing the subtotals by the grand total of transportation-related costs can provide insight into the relative impact that changes in operating practices will have on overall costs.

Transportation Operations

The effectiveness of bus route planning and scheduling is the single most important factor in determining the efficiency and cost effectiveness of a transportation operation. Designing, managing, and analyzing how well seating capacity and vehicles are utilized is the most effective way to determine what elements are influencing overall transportation costs and whether efficiencies can be realized throughout an operation.

Buses Used to Transport 100 Students

Transportation efficiency is built on two basic principles: maximizing the use of available seating capacity (see Simple Capacity Utilization measure) and maximizing the number of times an individual bus is used during the day (see Runs Per Bus measure). This measure attempts to aggregate these two requirements to establish an understanding of overall routing efficiency and effectiveness. The principle of this measure is that in order to transport 100 students with one or fewer buses, it will be necessary to establish a multi-tier system that allows a bus to be reused. In addition, it would be necessary to place a sufficient number of students on the bus. Consequently, if a district were able to average 1.0 to 1.25 buses or less to transport 100 students it would be an indication of both effective capacity utilization and asset reuse. A total of 162 of 173 total survey respondents reported sufficient data to be able to calculate this measure.

Calculation

- Total number of buses reported as insured on the 4094 / (Total Number of Riders reported on the 4094/100)

Results

The survey results indicate that medium and larger fleets have a greater opportunity to fill and reuse buses than smaller fleets. As a result, the average buses per 100 student values for the medium and larger fleets are generally better than for smaller fleets. Table 3 summarizes the results below.

Table 3: Buses /100 Students by Fleet Size

Fleet Size	Count of Respondents	Average	Median
<=25	95	2.01	1.99
26 to 50	32	1.61	1.53
51 to 75	16	1.56	1.50
76 to 100	12	1.58	1.61
>=101	7	1.46	1.63

Analysis of the total number of students transported indicates that districts that transport a greater number of students are generally able to transport students with fewer resources than smaller districts. Table 4 details the buses per 100 students broken out by the total number of students transported.

Table 4: Buses/100 students by Total Students Transported

Number of students transported	Count of Respondents	Average	Median
<=1000	60	2.36	2.24
1,001 to 2,000	47	1.64	1.63
2,001 to 3,000	15	1.56	1.51
3,001 to 4,000	13	1.44	1.48
4,001 to 5,000	9	1.31	1.35
5,001 to 6,000	4	1.46	1.51
6,001 to 7,000	5	1.62	1.63
7,001 to 8,000	6	1.23	1.25
>=8,001	3	0.82	0.85

Runs Per Bus

Reusing a school bus throughout the day is a critical element of overall efficiency and cost effectiveness. In school districts where all of the schools start and end at the same time the maximum number of trips a bus can perform per day is, generally, two (one in the morning and one in the afternoon). In school districts where elementary, middle, and high schools all start at *different* times, the maximum number of trips a bus can perform is six (three in the morning and three in the afternoon). While there are a number of variations on this theme, it is important to understand that this measure looks at the *total* runs a bus performs for home to school trips in a given day.

This measure was calculated using data collected from the transportation benchmarking survey. Of the 173 surveys received, 169 (98 percent) had data that was valid for this calculation.

Calculation

- The total number of runs reported on the survey / the sum total number of buses reported in the fleet age question

Results

The survey results show that there are fewer opportunities and instances for smaller school districts (as indicated by smaller bus fleets) to consider the reuse of buses as a method of promoting efficient service delivery. Table 5 below indicates that smaller fleets are utilized one-third to one-half as often as fleets that are 51 buses or greater. In addition, the results also appear to indicate that small districts utilizing 50 or fewer buses are more likely to operate on a one or two tier bell system.

Table 5: Runs per Bus Per Day by Fleet Size

Fleet Size	Count of Respondents	Average	Median
< = 25	100	2.1	1.7
26 to 50	36	2.3	1.7
51 to 75	18	3.2	3.3
76 to 100	7	3.7	3.9
> = 100	8	4.8	5.2

Given that there are limited opportunities to reuse the bus in a single or two tier system, it is critical for transportation managers to ensure that capacity utilization is maximized in order to minimize the number of buses required to transport students.

Simple Capacity Utilization

This measure is designed to evaluate how transportation operations are utilizing the seating capacity available to them. This is an important measure because it forms one of the fundamental building blocks of efficiency and cost effectiveness. This measure was calculated using data collected from the 2005-2006 4094 report and from the transportation benchmarking survey. Of the 173 surveys received, 170 (98 percent) had data that was valid for this calculation.

Calculation

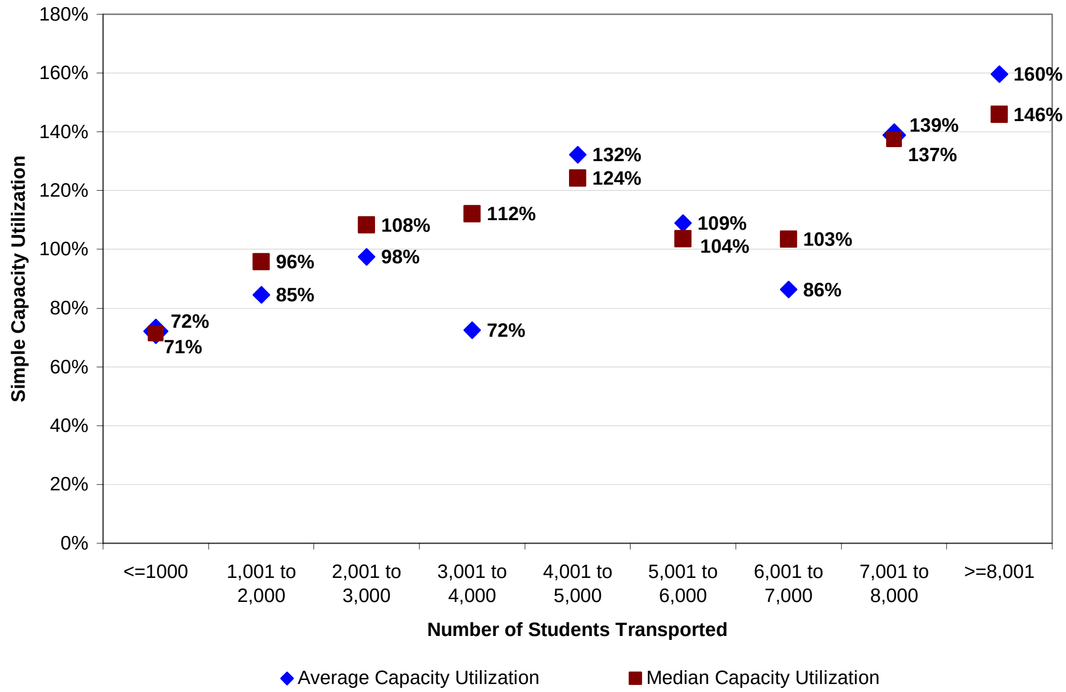
This measure was calculated several different ways. Each is described below:

- Overall Capacity percentage – Total riders reported on the 4094 / Total capacity reported on the transportation benchmarking survey

Results

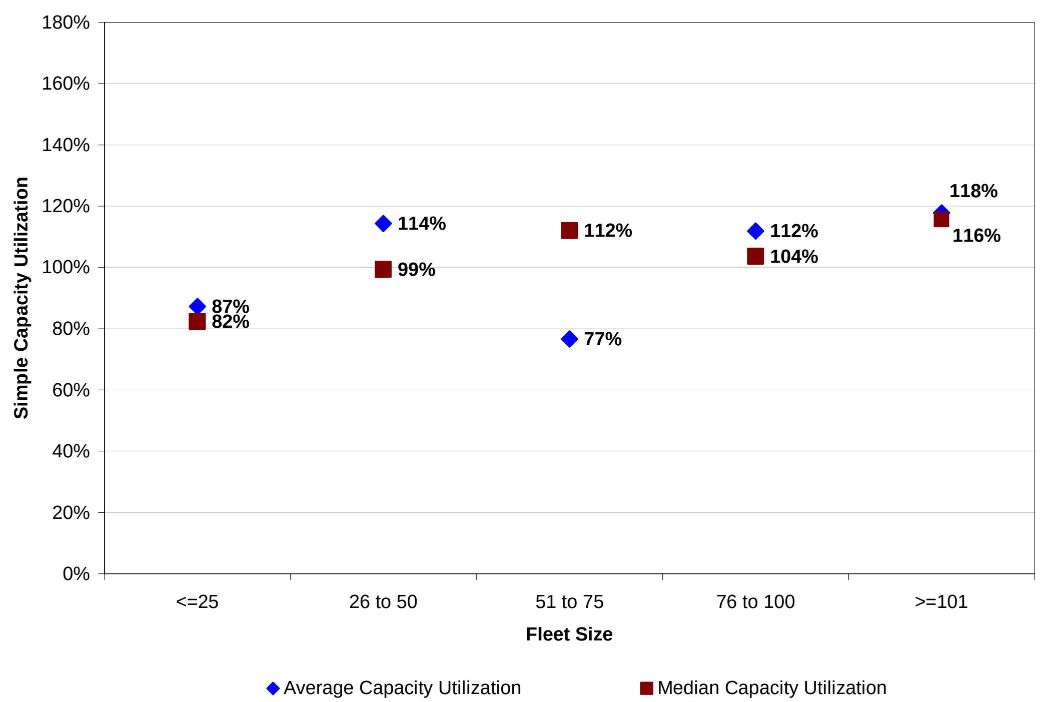
Analysis of survey results indicate that as the number of students transported increases, the effectiveness of capacity utilization also increases. However, there is a noticeable dip in capacity utilization for districts transporting 5,000 to 7,000 students. Nothing in the data is a specific indicator of why this might be. Additional data collection in future surveys may clarify why this is occurring. Figure 6 shows the percent of utilized capacity by number of students transported.

Figure 6: Simple Capacity Utilization by Number of Students Transported



Analysis of capacity utilization by fleet size indicates that fleets of 26 buses and greater are generally utilizing greater than 100 percent of available capacity. This is primarily being done through multiple trips of buses, as indicated in the Runs per Bus analysis detailed previously. Figure 7 shows the simple capacity utilization by fleet size.

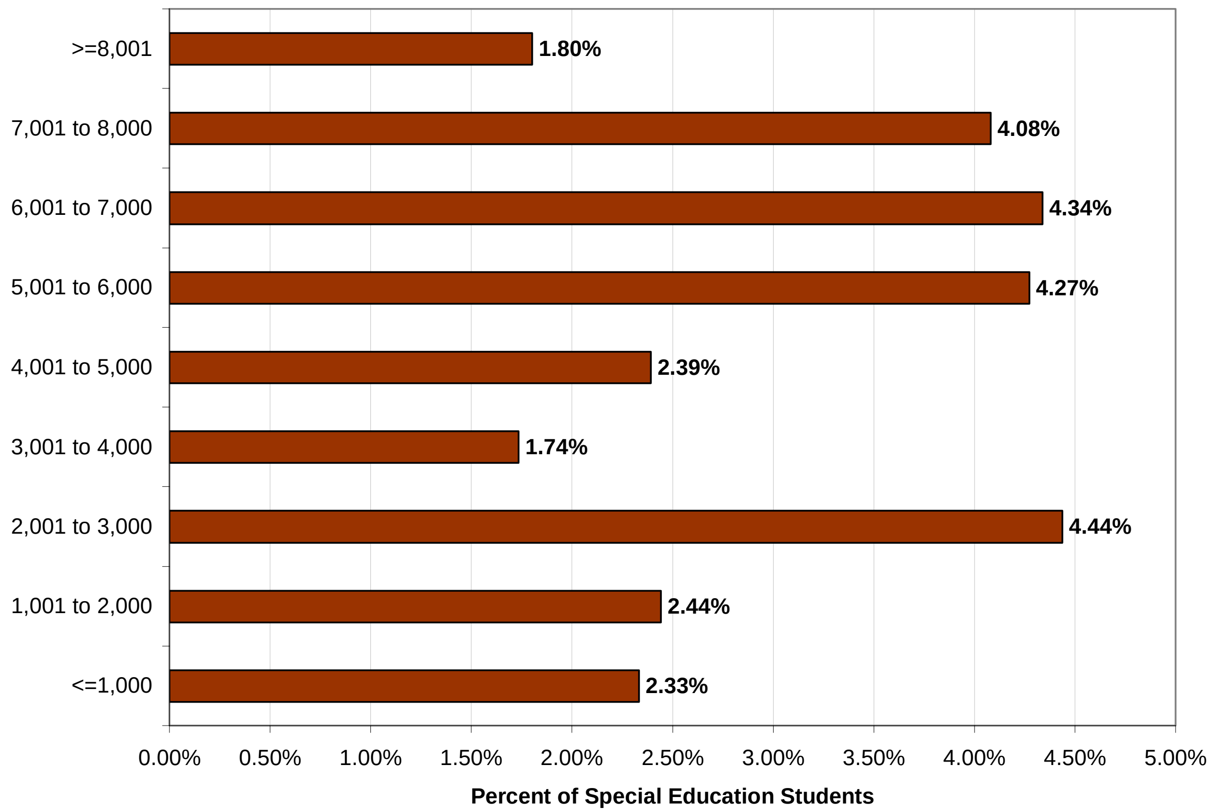
Figure 7: Simple Capacity Utilization by Fleet Size



Percentage of Special Education Students Transported

The transportation demands associated with special education students are both dynamic and challenging. As a result, the cost and administrative requirements associated with managing these students is generally greater than an equivalent number of traditional home to school students. Using data reported on the 4094, Figure 8 shows the percentage of special education students transported for the survey respondents. This measure can be used in conjunction with the financial measures to more clearly understand the key aspects of transportation costs, particularly if costs are above median or average measures for comparable districts.

Figure 8: Average Percentage of Special Education Students Transported



Of particular note is that for all districts transporting 8,000 or fewer students, it is not uncommon for 4 to 6 percent of the transported population to be represented by special education students. This indicates that nearly all districts, regardless of size, face the challenge of routing special education students.

Additional Measures for Consideration

A more complete understanding of transportation operations can be obtained from analysis of additional measures not presented here. These measures include:

- Average run time – The total time for completion of all runs by school type divided by the total number of runs by type.
- Planned capacity utilization – The simple capacity utilization measure presented above does not take into account any seating guidelines policies established by school boards. For example, if a policy allows only two students per seat, available capacity has been reduced by one third. To calculate this measure, seating guidelines would be applied to available capacity to determine actual available capacity. To determine planned capacity utilization, the total number of eligible students would be divided by actual available capacity.

Calculation of these measures would allow a more complete analysis of transportation operations, but the scope of this survey did not include collection of all the various data elements required to calculate these measures.

Fleet Maintenance and Management

A primary goal of every transportation department is to ensure that the fleet of school buses is reliable, safe, and economical to operate. The challenge of this function is to do this with the minimal number of resources possible in order to ensure the cost-effective delivery of services. Effective fleet management includes vehicle and equipment maintenance and repair; managing technician resources; managing parts inventory; and ensuring shop safety.

Two measures were calculated from the survey data that provide insight into the appropriateness of maintenance staffing. Buses per technician and vehicle equivalent units per technician can be used to analyze where sufficient maintenance technicians are available to fully address the maintenance demand presented by the school bus fleet and the general district fleet of buses, vehicles, and equipment. Fleet age and mileage analyses were also conducted to understand fleet replacement practices. Finally, additional measures for consideration are provided to allow for a more comprehensive analysis of the provision of maintenance services.

Buses per Technician

Fleet maintenance services are a critical element in the effective management of a student transportation program. The availability of a sufficient number of skilled technicians is necessary to ensure that buses can be properly and safely maintained. This measure was calculated using data collected from the transportation benchmarking survey. Of the 173 surveys received, 142 (82 percent) had data that was valid for this calculation.

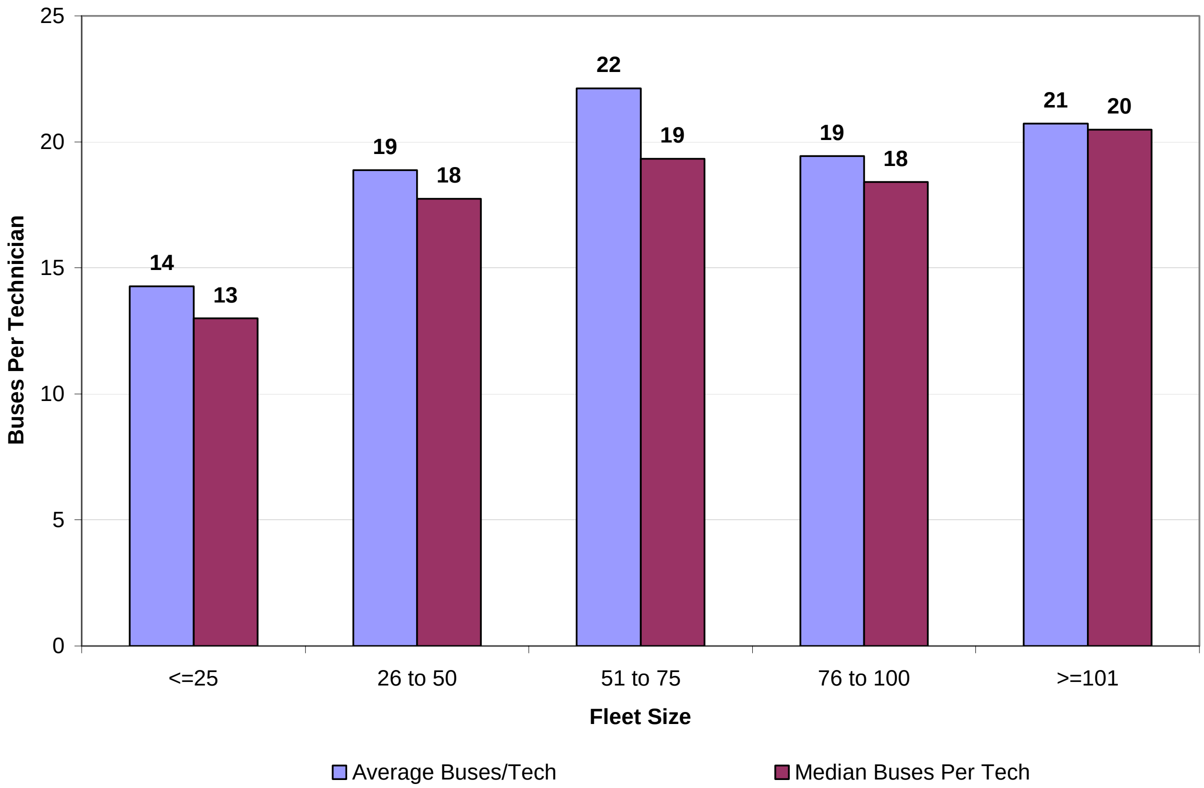
Calculation

- The total number of buses reported on the survey / the total number of technicians reported on the survey

Results

The average number of buses maintained by a technician is 17 with a range of 5 to 51 buses per technician. Figure 9 summarizes the range of technicians by fleet size for the survey respondents.

Figure 9: Buses per Technician by Fleet Size



The survey data does not provide any definitive insight into the proper buses to technician ratio. However, the survey indicates that for all fleets greater than 25 buses one full time technician is utilized for approximately every 20 buses regardless of fleet size. It is important to note that a number of factors will determine how many technicians are required in a maintenance operation. Considerations must include: what services will be done in house versus outsourced; what shift alignments will be used to provide services; what other vehicles and/or equipment will be maintained by technicians; and what skills will be required of technicians. Establishing a proper balance between fleet size and the number of technicians required is critical to ensuring both high levels of technician productivity and cost effective maintenance.

Vehicle equivalent units per technician

In order to more completely evaluate the appropriateness of maintenance staffing, it is necessary to include all vehicles and equipment other than school buses that technicians must maintain. Typically, these include administrative sedans, pickup trucks used for buildings and grounds operations, grounds maintenance equipment, and large trucks. The most common method in the maintenance industry to evaluate the supply of mechanics necessary to maintain the demand presented by a fleet of vehicles and equipment is through the use of a concept known as vehicle equivalent units. This concept was originally developed by the United States Air Force and relates all vehicles to a standard, baseline unit. The baseline unit used is the average aged administrative sedan. The sedan is given a value of 1.0 vehicle equivalent unit

(VEU) and all other vehicles and equipment are compared to this value. For purposes of the analysis of survey results, the following values were utilized:

- Auto – 1.0 VEU
- Pickup – 1.5 VEU
- Large Truck – 2.5 VEU
- Miscellaneous equipment - .75 VEU
- School Buses – 3.7 VEU

By analyzing the total demand presented by all vehicles and equipment that must be maintained, a more thorough understanding of the appropriateness of maintenance staffing can be determined. Of the 173 surveys submitted, 142 (82 percent) had data that was valid for this calculation.

Calculation

- The total number of each vehicle type reported was multiplied by the values above and sum totaled / the total number of technicians reported on the survey

Results

The most appropriate method to analyze this value is through total fleet size given that this is the value that determines the VEU demand. Table 6 summarizes the number of vehicle equivalent units per technician based on the total number of units maintained by the technicians. This is one of the few measures where there is a direct comparison available with alternative service providers. Industry data indicates that one full time equivalent technician should be able to maintain approximately 100 to 125 vehicle equivalent units. This is equal to one technician maintaining approximately 27 to 34 school buses. (It should be noted that this value is significantly higher than the average buses per technician of 17 calculated in the Buses per Technician section).

Table 6: Vehicle Equivalent per Technician

Fleet Size	Count of Respondents	Average	Median
<=25	37	57.6	56.3
26 to 50	55	80.0	74.6
51 to 75	19	90.7	83.6
76 to 100	14	90.0	83.4
>=100	18	84.2	81.5

Regardless of fleet size or total VEU demand, none of the fleets reaches 100 vehicle equivalents per technician as a median or average value. This would indicate that all fleets, particularly larger fleets, should evaluate their maintenance staffing to ensure that it is properly sized. In addition, these values indicate an opportunity to evaluate the feasibility of increasing collaboration between larger and smaller or several smaller fleet maintenance operations to improve the utilization and productivity of maintenance staff.

Fleet Age and Mileage

It has long been understood that the age and mileage of the buses has a significant impact on maintenance demands, safety and reliability of the fleet. The survey collected data on the age range and accumulated mileage of school buses in the respective fleets. Of the 173 surveys submitted, 172 had data that was valid for this calculation.

Results

The following figures show the average low and high end range of fleet age and mileage by fleet size. As part of the survey process, actual inventory data was not collected that allowed for exact calculations of average age and mileage ranges. Consequently, these values were calculated using the high and low end range requested on the survey. These values serve as a proxy for actual average age or mileage calculations.

Figure 10 shows an average age of roughly four to eight years, which would equate to an approximately 8 to 16 year average replacement cycle for the buses included in the survey. The figure also appears to demonstrate that larger fleets are more able to replace vehicles in a timely manner (approximately 8 to 12 year replacement cycle) than smaller fleets (12 to 16 year replacement cycle.

Figure 10: Average Fleet Age Range

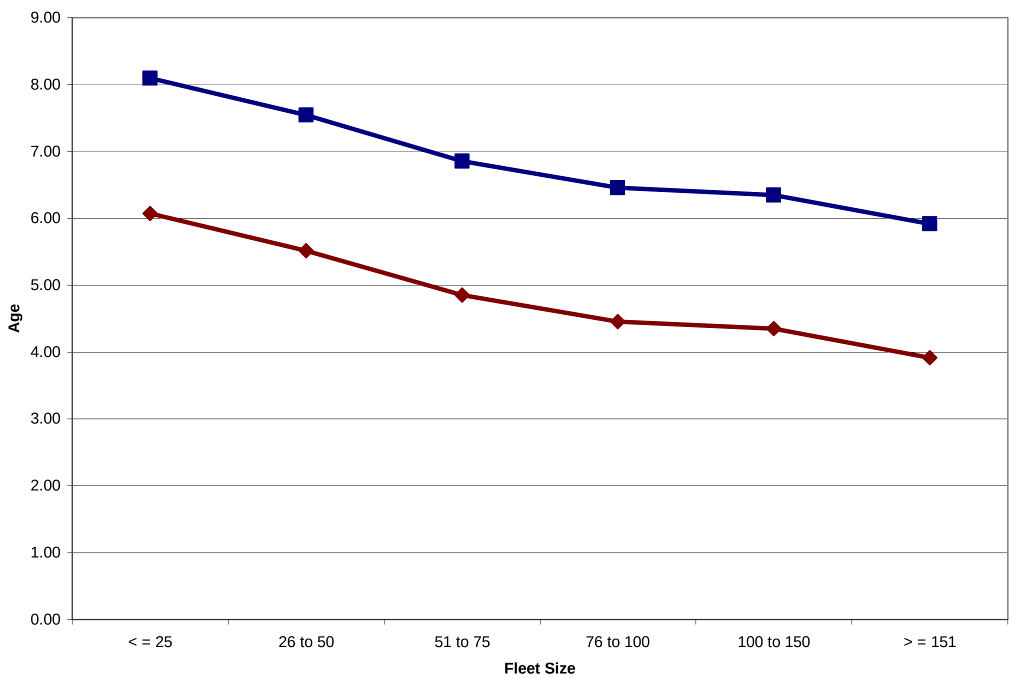
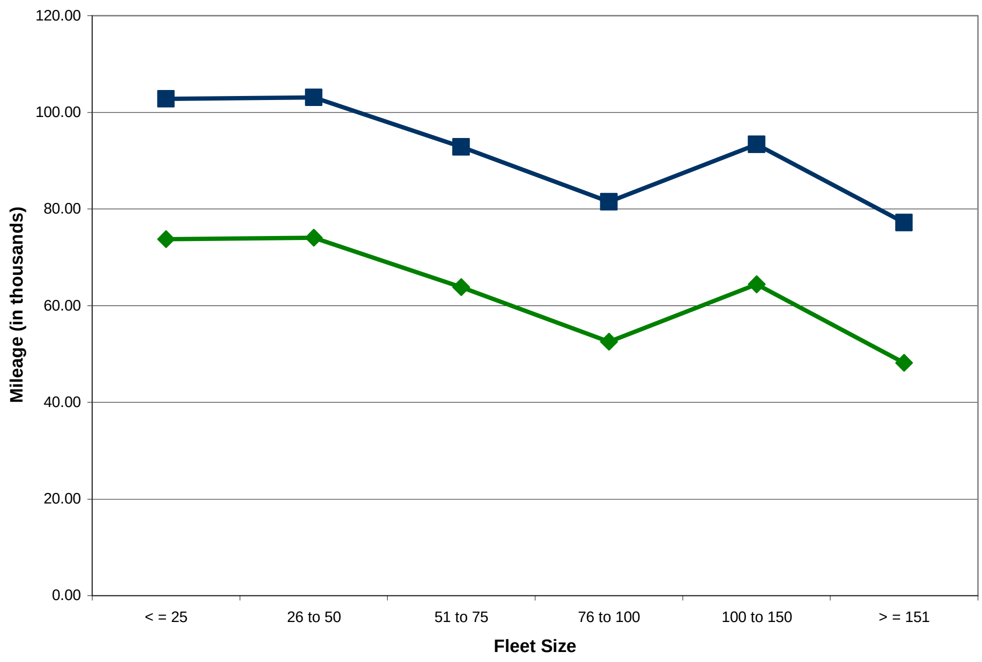


Figure 11 shows the average fleet mileage distribution by fleet size. Similar to the results of the age analysis, smaller fleets generally have accumulated more miles than larger fleets. In addition, this figure suggests that fleet replacement criteria range from approximately 100,000 to 200,000 miles.

Figure 11: Average Fleet Mileage Range



Additional Measures for Consideration

Understanding maintenance operations requires consideration of a number of additional measures not presented here. Additional measures that would provide increased insight into maintenance operations and the data required to calculate them include:

- Annual maintenance and repair costs per vehicle equivalent unit – Total labor, parts, and outsourced maintenance services, exclusive of fuel, divided by the total number of vehicle equivalent units. Current industry data indicate guideline values of $1,000 to $1,250 per vehicle equivalent unit.
- Annual parts cost per vehicle equivalent unit – Total value of all parts related expenditures divided by total vehicle equivalent units. Based on comparative industry data this value should be approximately $250 to $350 per vehicle equivalent unit.
- Technician productivity – Total labor hours billed per full time technician should be approximately 1,400 to 1,500 hours per year for a 2,080 hour year.

Additional data collection and analysis would be required to calculate these measures.

Appendix 1 – Regional Groupings of Intermediate School Districts

Region 1 - Upper Peninsula
COPPER COUNTRY ISD
EASTERN UPPER PENINSULA ISD
DELTA SCHOOLCRAFT ISD
DICKINSON-IRON ISD
GOGEBIC ONTONAGON ISD
MARQUETTE ALGER ISD
MENOMINEE ISD

Region 2 - Northern Lower Peninsula
ALPENA-MONTMORENCY-ALCONA ESD
CHARLEVOIX EMMET ISD
CLARE GLADWIN ISD
COOR ISD
COP ISD
IOSCO RESA
MANISTEE ISD
MASON LAKE ISD
MECOSTA OSCEOLA ISD
NEWAYGO COUNTY ISD
OCEANA ISD
TRAVERSE BAY ISD
WEXFORD MISSAUKEE ISD

Region 3 - Western
ALLEGAN COUNTY ISD
BARRY ISD
BERRIEN ISD
IONIA COUNTY ISD
KALAMAZOO RESA
KENT ISD
LEWIS CASS ISD
MONTCALM AREA ISD
MUSKEGON ISD
OTTAWA AREA ISD
ST. JOSEPH ISD
VAN BUREN ISD

Region 4 - Thumb and surrounding areas
BAY ARENAC ISD
GENESEE ISD
GRATIOT-ISABELLA ISD
HURON ISD
LAPEER ISD
MIDLAND ISD
SAGINAW ISD
SANILAC ISD
SHIAWASSEE RESD
ST. CLAIR ISD
TUSCOLA ISD

Region 5 - South Central
BRANCH ISD
CALHOUN ISD
CLINTON ISD
EATON ISD
HILLSDALE ISD
INGHAM ISD
JACKSON ISD
LENAWEE ISD
LIVINGSTON ESA
MONROE ISD

Region 6 - Southeast
MACOMB ISD
OAKLAND ISD
WASHTENAW ISD
WAYNE RESA