AN ANALYSIS OF THE FUNDING OF PUBLIC SCHOOL TRANSPORTATION IN NORTH CAROLINA

by

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(ABSTRACT)

The purpose of this study was (1) to examine the pupil transportation program in North Carolina relative to those used in the fifty states, (2) to examine variations in pupil transportation costs among North Carolina's school districts, (3) to identify factors related to variations in per pupil transportation costs and (4) to compare North Carolina's present pupil transportation funding method with an alternative cost effective method using widely recognized principles of pupil transportation finance.

The research design for this study was implemented in four phases. First, pupil transportation information was collected from all states in order to review the current state pupil transportation programs. Second, pupil transportation literature was reviewed to identify cost factors, fiscal models and evaluative criteria. Third, pupil transportation data for the 1990-91 school year were collected from all school districts in North Carolina and analyzed. The best predictor(s) of cost was determined by using appropriate statistical analysis (such as correlation, stepwise multiple regression analysis and scattergrams) to examine the relationship between per pupil transportation costs (dependent variable) and various independent variables that contribute to variations in cost. The best predictor of cost was used in an alternate funding formula. Finally, computer simulation was used to analyze the fiscal implications of the alternate formula on the school districts and the state.

Based on the results of this study, three recommendations were offered. First, North Carolina should adopt a cost effective pupil transportation funding model using linear density as the primary determinant of funding. Second, North Carolina should conduct a study that would explore the potential savings that could be generated by school districts cooperating in the delivery of pupil transportation. Third, North Carolina should adopt the alternate equation (regression equation utilizing linear density as the cost predictor) for use in distributing pupil transportation funds.

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INTRODUCTION

A long accepted principle of the American people has been to place within the reach of every child the opportunity for an education. While education traditionally has been valued by most Americans, providing an educational setting for children has not always been a practical matter. In the early days of public education, schools were placed as close as possible to the pupils which contributed to the creation of very small school districts throughout most of the United States. Although for many years most children have lived within walking distance of small, local schools, other children's domiciles are so widely dispersed that some form of transportation must be provided.

Transporting pupils at public expense has been an integral part of American public education for well over a century. The earliest record of pupil transportation, usually at private expense was in 1840. The first law authorizing the expenditures of public funds for pupil transportation can be traced to Massachusetts which initiated the first transportation program in 1869 (Featherson and Culp, 1965). Children were brought to school in horse-drawn carts and carriages paid for by school funds. Thus, pupil transportation was recognized for the first time as "a legitimate part of the community's tax program."(Johns, 1928). By 1900 eighteen states had enacted school transportation laws, and by 1919 pupil transportation at public expense was legal in all states (Abel, 1923). It was not until after the turn of the twentieth century that state legislation began to require transportation programs rather than to merely permit their establishment. The result was increased spending for pupil transportation; and by 1920, the 48 states were spending over 14.5 million dollars for pupil transportation (Abel, 1923). In 1966 over fifteen million pupils in America were driven to and from school each day, and more than $787,000,000 was spent for this purpose (Hutchins and Barr, 1963). The school transportation system has continued to grow. Statistics indicate that during the school year 1977-78, 21.7 million, or 54 percent of all pupils in attendance, were transported to school daily at public expense of 2.7 billion dollars (Grant and Eiden, 1980). In 1989-90 over 22.5 million pupils were transported at an expense of $7.6 billion dollars. Although a wide disparity exists in the number and scope of state statutes relating to pupil transportation, " . . .state financing of transportation and school bus standards received more attention in law, when all fifty states are considered, than any other subjects in the field of transportation" (Featherston and Culp, 1965).

Since the beginning of this century school transportation has been part of the educational scene. Consideration of the pupil transportation movement must be accompanied by equal consideration of the school consolidation movement. After the Second World War, when the school consolidation movement gained momentum, school busing took on more importance as the method of transporting large numbers of pupils from the rural areas, where schools were being closed, to the larger consolidated schools. The consolidation and transportation movement spread rapidly and many states enacted legislation permitting or requiring schools to provide transportation service to their students.

Busing became an important service for the rural schools at first, and later for the schools located in urban and metropolitan areas. Children could no longer secure an elementary and secondary education within walking distance of their home. In recent years, demands for broader academic programs have necessitated the consolidation of small, local schools into larger schools. As the use of buses for pupil transportation became common, the demand for this service was growing among parents in all types of school districts. Attitudes toward travel have been incorporated into educational thinking to the extent that transporting pupils to school at public expense is no longer a question of acceptance but one of degree. Students board the bus to take advantage of an educational opportunity that does not exist in their immediate neighborhood. Bringing together students from previously separate schools will make available educational opportunities that before were denied, at least for some of the students. The National Education Association's Department of Rural Education in 1953 states that the only justification of the pupil transportation effort will be in terms of an intangible--the educational opportunity it contributes, despite its tremendous outlay for capital. The transportation system must be designed or altered to realize the potential of the consolidation.

Roe (1961) categorizes busing systems into two classes, one involved with populated urban and suburban centers while the other involves sparsely populated rural areas. Urban and suburban school transportation presents a different set of problems than does busing in the rural regions. The area from which students are drawn for a certain school building may depend on the capacity of the structure or willingness of the local district to finance transportation. Distances traveled by pupils in urban and suburban areas are small, while in sparsely populated regions, distances are determined by how far the bus routes can reasonably extend into the surrounding countryside.

A declining rural farm population within a predominately urban society makes pupil transportation a necessity. With many small schools losing their pupils, consolidation together with longer bus routes are inevitable to insure a competitive education for the remaining rural pupils.

By examining one of Johns' criteria for whether or not an activity should be supported by public tax dollars, the growth and public support of pupil transportation can be explained. He contends that ". . . if that activity can be done more efficiently at public expense than private expense, it is a legitimate part of the community tax programs" (Johns, 1968). Increased centralization and consolidation of schools placed the burden on the community as a whole rather than each family providing the service individually. The criteria of efficiency supported public support for transportation services. School busing has become the largest single transportation system in the country.

NEED FOR THE STUDY

Getting a child to school was originally an individual family responsibility, but the pattern by which formal education grew made public support for pupil transportation necessary. Featherson and Culp (1965) credited three factors as primarily responsible for school transportation growth: (a) the passage of compulsory attendance laws, (b) the consolidation of rural attendance centers, and (c) the increased holding power of secondary schools, which is a recent development. State legislatures have stimulated the growth of transportation systems by providing financial support. Laws were passed that require a bus for those students living beyond certain specified distance limits. Recent trends in school statutes generally point toward more accessible transportation at public expense.

Pupil transportation is a necessary element in the education of rural children if some degree of equalization of educational opportunity is to be realized. A program which affects so many pupils and requires a sizeable portion of the available school revenue should be examined in detail in order to establish guidelines for efficient and economic operations. Further, detailed examination of the program is necessary in order to point the way to desirable changes and, in this way, attention may be focused on current weaknesses in the program.

Dramatic increases in fuel cost, equipment, salaries, and insurance are causing transportation costs to rise dramatically. Subsequently, methods of financing pupil transportation will receive increasing attention as public pressure mounts to insure full value for all educational expenses.

A review of state pupil transportation programs reveals many different approaches to the problem of funding pupil transportation. Although pupil transportation costs and the ability to pay for them usually vary considerably among the school districts of a state, the sound principles of fiscal equalization often are not used in pupil transportation. Some states, however, recently have developed and adopted distribution formulas which provide for fiscal equalization.

There are variations in per pupil transportation costs among school districts of a state. Economy of scale factors related to transportation costs include: road conditions, topography, geographic locations, equipment depreciation, salaries, number of pupils transported, bus miles traveled, number of buses used, size of buses, capital outlay, assessed valuation, the number of transported pupils per bus mile, the number of transported pupils per square mile, and total dollars of expenditure for transportation. Objects of expenditure include: bus replacement costs, driver's salaries and benefits, gasoline costs, grease and lubrication costs, tire and tube replacement, repair expenses, insurance premiums, storage costs, and miscellaneous expenses.

Most states utilize several of these factors in the distribution of funds to the local school districts. Studies in West Virginia, Illinois, Tennessee, Florida, and Indiana have indicated that the major factor beyond the control of the local board of education affecting transportation costs is the number of transported pupils per bus route miles traveled (linear density).

The public schools of North Carolina range along a size continuum from very small rural enrollments to large urban institutions. Pupils from the rural areas are bused into various sized high schools operating in small rural communities or in larger towns and urban centers. As a result rural pupils usually experience a considerably longer school day than other bus pupils, as measured from the time they board the bus in the morning until they are returned home in the evening.

In the mountainous areas of North Carolina, the size of the school depends partially on how large the geographical area has been encompassed. Often, the school size is dependent on how many minutes or hours the pupils are expected to be transported to and from school.

Variations in per pupil expenditures for pupil transportation, as well as diverse economic and geographical conditions within the state, justified an analysis of the funding of pupil transportation in North Carolina.

The results of this study should provide guidelines which will enable individual school systems to consider improvements in the efficiency and effectiveness of their pupil transportation programs in terms of the services selected as being best suited to their needs and the level of financial support available from local and state sources. In this way, local incentive for providing an adequate and safe service through the proper utilization of the funds available is maintained. Also, the state distribution plan should be studied to insure that it provides for the equitable distribution of transportation funds to all school districts in the state.

Transportation funds, which are not reimbursed by the state, are funds that could be denied the instructional program of a school district. Therefore, it could be argued that the greater the transportation needs and costs, the more the instructional program may suffer for school districts facing a serious shortage of revenue.

PURPOSE OF THE STUDY

The purpose of this study is to compare the pupil transportation program in North Carolina relative to those used in the fifty states, to examine variations in transportation costs among North Carolina's school districts, and to analyze the present pupil transportation funding method and alternative funding plans in relation to recognized principles of pupil transportation finance.

With this analysis, the following questions were addressed:

1. What types of funding plans are used for pupil transportation in other states, and what are the valid, established criteria which has been used to evaluate state pupil transportation programs?

2. How adequately does the North Carolina pupil

transportation program meet the identified valid, established evaluative criteria?

3. What factors contribute to the variation in the per pupil expenditures for pupil transportation services among the school districts of North Carolina, and which factor(s) is the best predictor of per pupil expenditures for transportation?

4. What alternate funding plans should be considered for use in North Carolina, and what are the fiscal implications of such plans for the school districts and the state?

DEFINITION OF TERMS

Most terms used in this study are defined within the text of the study. In order to provide a common basis of understanding as to the meaning of certain terms used in this study, the following definitions are offered.

Average Daily Attendance (ADA)

ADA means average daily attendance and refers to the aggregate days attendance of a given school during a reporting period divided by the number of days school is in session during this period.

Average Daily Membership (ADM)

Average daily membership is the aggregate membership of a school during a reporting period divided by the number of distribution of all state funds except categorical.

Average Daily Transported (ADT)

The average number of students eligible for transportation on any day of the reporting period.

Area Density

The number of transported pupils per square mile is area density. It is computed by dividing the ADA of transported pupils by the number of square miles of the area served.

Assessed Valuation

The value of the property contained within the school district area as determined by the county assessor.

Average Daily Mileage

The average daily mileage is computed for each bus from the point where the first pupil is picked up in the morning to the point where the last pupils is discharged in the afternoon. This includes regularly scheduled trips between schools, but excludes all special trips. Ordinarily, if the length of a bus route is changed during the year, the average of the daily mileage shall be used.

Capital Outlay

An expenditure that results in the acquisition of fixed assets, or additions to fixed assets, which are presumed to have benefits for more than one year. It is an expenditure for land or existing buildings, improvements of ground, construction of buildings, additions to buildings, remodeling which are presumed to have benefits for more than one year. It is an expenditure for land or existing buildings, improvements of ground, construction of buildings, additions to buildings, remodeling of buildings, or initial, additional, and replacement equipment.

Cost Per Mile

Cost per mile is the total transportation expenditure divided by the total number of miles transported.

Cost Per Pupil

Cost per pupil is the total transportation expenditure divided by the average daily membership.

Daily Route Mileage

Daily route mileage is the total miles driven by the combined bus of the school district for each day the school was in session.

Cost of Replacement

Replacement costs are limited to expenditures for the purchase of school buses which do not increase the total number in the fleet.

Deadhead Miles

Deadhead miles represent school bus mileage from the storage area to the point where the first pupil is picked up in the morning and the mileage back to the storage area from the point where the last pupil was discharged in the afternoon.

Economy of Scale Factors

Factors that show decreasing costs per unit with increased volume of units which would be total miles traveled. number of pupils transported, and total transportation cost.

Equity in Financing Pupil Transportation

The purpose of the equalization concept is to extend state aid for pupil transportation with regard to both need and fiscal capacity. It is the allocation of state funds for pupil transportation in relation to the burden of the district to provide transportation services and to the financial ability of the district to support an educational program.

Linear Density

Linear density is the number of transported pupils per mile of bus route. It is computed by dividing the total average daily attendance of transported pupils by the total number of one-way miles pupils were transported on regular transportation routes.

Objects of Expenditure

Objects of expenditure in the categorical budget are items such as: bus replacement costs, drivers' salaries and benefits, gasoline costs, oil and lubrication costs, tire and tube replacement, repair expenses, insurance premiums, storage costs, and miscellaneous expenses.

State Transportation Aid

State transportation aid is the financial aid granted by a state, amounting to all or a portion of the cost, to school districts for the purpose of transporting pupils to and from school.

Transportation Need

The need for pupil transportation is basically the number of students that have to be transported to and from school and the number of miles they have to be transported. It was recognized by the authorities that the basis for allocating state funds for pupil transportation generally was based on this need. This need has become to mean the total cost of the pupil transportation program for the district or state considering those factors which best seemed to identify those needs. These needs are implemented in the mechanics of an adopted state formula. Identified factors in state formulae for determining transportation needs are:

1. Number of pupils transported;
2. Number of buses;
3. Number of bus miles;
4. Road conditions;
5. Cost experience;
6. Reference year;
7. Pro-rated funds;
8. Density-pupils per square mile or pupils per linear

mile;

9. Depreciation of buses; and

10. Special provisions for the handicapped.

LIMITATIONS OF THE STUDY

A complete and inclusive study involving all the financial implications of pupil transportation in the United States is beyond the scope of this study. It is acknowledged that a close relationship existed between state and local support and the administration, organization, and operation of pupil transportation programs in the 50 states. As the result of a nation-wide analysis of state plans for financing pupil transportation made in 1965, Murray determined that each state had a unique problem with respect to the development of its state plan for financing pupil transportation. He concluded that it was questionable whether any one plan or formula could meet the need of each of the 50 state. In regard to Murray's analysis and in view of the impracticality of conducting another nation-wide study within reasonable time constraints, this present research deals primarily with analyzing the distribution of regular transportation funds in the State of North Carolina for the 1990-1991 school year.

ORGANIZATION OF THE STUDY

Chapter I presents a brief introduction and overview of pupil transportation programs, the need for the study, the purpose of the study, the problem, definition of terms, the limitations of the study, and the organization of the study.

Chapter II presents a review of the pertinent literature and research related to pupil transportation funding. Criteria for the evaluation of pupil transportation state aid plans are discussed. This chapter also reviews the growth and development of pupil transportation programs and presents the findings of a national survey of state pupil transportation programs.

Chapter III presents research methodology used in this study. A detailed examination of the data gives both sources and techniques used in gathering and analysis.

Chapter IV contains an analysis of the data.

Chapter V presents conclusions and makes recommendations for further research based on questions posed by this study.

Chapter 2

REVIEW OF RELATED LITERATURE

DEVELOPMENT OF PUPIL TRANSPORTATION

The public school system in America has evolved from the basic precept that all children have an inherent right to a free public education. Our founding fathers conceived only of a system for elementary education, but the citizenry soon demanded expanded programs and more services. Pupil transportation was unnecessary so long as the school was within walking distance of all the pupils who wanted to attend school. Our forbearers planned early rural schools within walking distance; but many children could not be served because they lived in sparsely populated areas. Soon, many new services, including the transportation of pupils was seen as a governmental responsibility.

From the earliest days of the nation until shortly after the close of the War Between the States, pupil transportation services were decidedly limited. Children who lived more than walking distance from school journeyed by whatever means their families or neighbors could provide. In the main, pupil transportation meant a long often hazardous ride in a wagon proffered by some family in the neighborhood. In many instances, the child traveled by horseback; in other instances, a canoe or rowboat served as a means of travel. Pupil transportation, on the whole, during this period was on a private basis, and the family, rather than some governmental unit, assumed the responsibility for providing the necessary service.

The concept that the state had the obligation to place the means for obtaining an education within the reach of every child did not exist in the minds of the American people in the early colonial days; neither did it develop during modern time. It was the result of a gradual evolution that began during the colonial period and rapidly developed in the nineteenth and twentieth centuries (Featherston and Culp, 1965). In the colonial period, the school was an agency of the church rather than the state. Thus, the need for the government to "interfere" did not seem relevant at that time.

The period of the Enlightenment, with its growing respect for human reason, science, humanitarianism, and republicanism fostered the growth of the idea of public education under public control to serve the whole public. Consequently, public schools under governmental direction that were free from religious, sectarian, or private control rapidly came into existence.

As the need for pupil transportation grew the states began to respond. It became apparent that too many pupils who did not live within walking distance of school simply ceased to attend school. Some students went to school as time permitted while others boarded with someone who lived close to school until the term was over.

Many of the early opposition to pupil transportation can still be heard today: "(1) uncertainty about the expense involved, (2) doubt that pupils could be transported safely and comfortably, (3) long absence of children from home (they would have to leave too early and would not get back in time to 'do chores'), and (4) belief that bad influences lurked across the township line" (Stollar, 1971).

The first step toward state provided pupil transportation came in 1869 in Massachusetts. A statute was enacted which legalized the collection and expenditure of local funds for pupil transportation. In summary, the statute stated:

> Any town in the Commonwealth may raise by taxation or otherwise an appropriate amount of money to be expended by the school committee at their discretion, in providing for the conveyance of pupils to and from the public schools (Commonwealth of Massachusetts, 1869).

Other states slowly followed the lead of Massachusetts. Seven years later Vermont enacted a similar law permitting publicly funding of pupil transportation services. Very slowly the rest of the states followed suit. By 1900 only one-third of the states had enacted similar legislation. The remaining states established public support for pupil transportation during the next 19 years. In 1933 all fifty states had enacted laws which allowed the expenditure of public funds for pupil transportation (Table 1). These laws passed by the state legislatures provided the legal framework which authorized the expenditures of public funds for pupil transportation. However, pupil transportation laws of this era were funded nearly exclusively from local resources and generally were permissive in nature.

School buses were originally an adaptation of the farm wagon, so the name "transportation wagon" was appropriately applied. This horse drawn "bus" had been specially designed for transporting children and it had definite characteristics which distinguished it from other horse-drawn conveyances of that particular era. Distance by horse-drawn vehicle was of course limited. Brown's assessment of transportation in his Tennessee district during 1917 illustrates the mileage boundaries then existing. He wrote, "Twenty-two transportation wagons are in use, hauling from twenty to thirty children, each a distance of from two to six miles." These school systems generally were organized to place the schools within reasonable walking or horse transportation distances from homes and farms of the local population. The vast majority of these schools were tiny, with few teachers and they served a small number of pupils. As recently as 1925-26 there were approximately 163,000 one-teacher schools (Featherston, E. G. and Culp. D. P., 1965).

During the early part of the twentieth century, motorized conveyances began to replace the horse and buggy. The automobile and the small truck, with its covered bed, became the most common vehicle used to transport pupils to schools. The ingenuity of the parents became apparent. Parents often pooled their resources in an effort to economize, and a single vehicle would be used to transport several people to the public school. At that time, each family paid a small sum for each child who would ride to school, usually with an older child who lived farthest from the school house. The pupil transportation route or "bus route," as it was now commonly called, thus became part of the American educational scene. The parents had unknowingly provided the underlying principles of the present bus route system in providing one means for obtaining an education for their children. At that time the education of the child was an individual effort of the parents to be carried out as they saw best for their own children. The rapid expansion of school busing could not have been possible without the breakthrough caused by the invention and acceptance of motorized vehicles. Transportation in the form of cars, trucks, and buses became inexpensive enough for most americans. In fact, the growth of pupil transportation has paralleled the development of the motor vehicle and the building of improved all weather surface rural roads (Jarvis, Gentry, and Stephens, 1968).

At the beginning of the nineteenth century, the states were vigorously involved in the responsibility for education and the growing concept of "the equalization of educational

TABLE 1

FIRST TRANSPORTATION LAWS

State	Year	State	Year
Massachusetts	1869	Maryland	1904
Vermont	1876	Oklahoma	1905
Maine	1880	Utah	1905
New Hampshire	1885	Missouri	1907
Florida	1889	West Virginia	1908
Connecticut	1893	Colorado	1909
Ohio	1894	Mississippi	1910
New Jersey	1895	Arkansas	1911
New York	1886	Georgia	1911
Iowa	1897	Illinois	1911
Nebraska	1897	North Carolina	1911
Pennsylvania	1897	Kentucky	1912
Wisconsin	1897	South Carolina	1912
Rhode Island	1898	Arizona	1912
Kansas	1899	Idaho	1913
North Dakota	1899	Tennessee	1913
South Dakota	1899	Nevada	1915
Indiana	1899	Alabama	1915
California	1901	Texas	1915
Minnesota	1901	Louisiana	1916
Washington	1901	New Mexico	1917
Michigan	1901	Delaware	1919
Montana	1903	Wyoming	1919
Oregon	1903	Hawaii	1919
Virginia	1903	Alaska	1933

J. F. Abel, "Consolidation of Schools and Transportation of Pupils," Bureau of Education Bulletin, No. 41, Washington, D.C.: Government Printing Office, 1923, p.22; Laws of the Territory of Hawaii, 1919, Act CXXVI; Territory of Alaska, Session Laws, Resolutions and Memorials, 1933, Chapter XLII, Sec. 7 (h).

opportunity" (Johns, 1983). Any discussion today of the states' responsibility for public education is certain to involve that phrase (Burns, 1927). To provide adequate educational opportunities, the states recognized that it would be necessary to centralize or consolidate schools. Featherston and Johns in their discussion of pupil transportation cited centralization of school districts as a major force that led to public support and state aid for pupil transportation. Public support for pupil transportation programs developed during the last half of the nineteenth century primarily because of two basic developments. First, compulsory attendance laws were enacted by many states based on a growing concern that the welfare of the state and nation depended on an enlightened citizenry. If a state was to require attendance, then schools must be located close to home, or transportation to and from school would have to be provided. The second development was the consolidation of one-room rural schools into more comprehensive regional schools. Rural populations were declining and in many instances regional populations were inadequate to support already established attendance centers. The lack of finances to provide adequate educational programs coupled with the need to consolidate attendance centers was used by many states as justification for the public support of pupil transportation programs. The history of pupil transportation is interwoven with the history of the consolidation of small schools into larger units. Although it is difficult to say just when and where consolidation began, it is probably true that from earliest times, some schools were abandoned for the sake of economy and efficiency and the children sent to neighboring districts.

The idea of consolidation, however, probably originated in cities and in the more densely populated towns, usually under special laws or acts of incorporation. After several cities established consolidated schools, these schools became a pattern for other cities in the state and for the more progressive rural communities. According to Louis Rapeer's study, the following schools and localities represent the first attempts to consolidate and provide pupil transportation:

> Quincy, Massachusetts: The first children to be transported at public expense under the Act of 1869 were in the town of Quincy. "There in 1874 a school with less than a dozen children was closed and the pupils carried to another one-teacher school, the union making a school not to large for one teacher. The district abandoning its school, after paying tuition and transportation expenses, found that its outlay was less than the amount which would have been required to maintain the old school."

> The Montague Consolidated School, Massachusetts: In 1875, this school, which represented the first consolidation for the definite purpose of securing better educational opportunities was established. The Montague School was organized to serve an area previously served by three district school, and the pupils were transported at public expense. The building was of brick and was centrally located.

Concord, Massachusetts: In 1879, the second consolidated school to be established was erected at Concord, Massachusetts. This centrally located building replaced several one-teacher schools and served an area of twenty-five square miles (Noble, 1940).

The fifteen-year period from 1910 to 1925 saw tremendous growth in both consolidation and transportation as illustrated in Table 2. By 1913 all states had enacted some type of consolidation law, and six years later, all had legislation regulating the transportation of pupils at public expense.

School consolidation flourished in the 1940's and 1950's and has continued at a much reduced rate until the present. In 1942 there were 108,579 school districts in the 48 continental United States and by 1982 there were only 15,032 school districts in 50 states (Glendenning, P.H. and Reeves, N.M., 1982).

Approximately 23 million children were transported to and from school in 1977, an increase of 22 million since 1925, when the majority of pupil transportation involved small rural schools. With the improvement of highways and motor vehicles by 1982, transportation was mainly to consolidated schools. Safety of pupils on streets and highways has become a major factor in the transportation to school of the elementary and secondary pupils that attend public schools in the United States (Franklin, 1983).

TABLE 2

FIRST CONSOLIDATION LAWS

STATE	YEAR	State	Year
CONNECTICUT	1839	MINNESOTA	1901
MASSACHUSETTS	1839	MISSOURI	1901
MICHIGAN	1843	PENNSYLVANIA	1901
VERMONT	1844	LOUISIANA	1902
OHIO	1847	OKLAHOMA	1903
NEW YORK	1853	OREGON	1903
MAINE	1854	TENNESSEE	1903
WISCONSIN	1856	VIRGINIA	1903
NEW HAMPSHIRE	1857	MARYLAND	1904
DELAWARE	1861	ILLINOIS	1905
INDIANA	1873	ARIZONA	1907
IOWA	1873	NEW MEXICO	1907
NORTH CAROLINA	1885	KENTUCKY	1908
NEW JERSEY	1886	WEST VIRGINIA	1908
FLORIDA	1889	COLORADO	1909
NEBRASKA	1889	ALABAMA	1910
WASHINGTON	1890	MISSISSIPPI	1910
TEXAS	1893	ARKANSAS	1911
SOUTH CAROLINA	1896	GEORGIA	1911
UTAH	1896	MONTANA	1913
KANSAS	1897	NEVADA	1913
RHODE ISLAND	1898	SOUTH DAKOTA	1913
NORTH DAKOTA	1899	WYOMING	1913
IDAHO	1900	HAWAII	1919
CALIFORNIA	1901	ALASKA	1933

J. F. Abel, "Consolidation of Schools and Transportation of Pupils," Bureau of Education Bulletin, NO. 41, Washington, D.C.: Government Printing Office, 1923, p.21. Laws of the Territory of Hawaii, 1919, Act CXXVI; Territory of Alaska, Session Laws, Resolutions, and Memorials, 1933, Chapter XLII, Sec. 7 (h).

CONSTITUTIONAL AUTHORITY AND LEGAL RESPONSIBILITY FOR PUPIL TRANSPORTATION

No state constitution specifically refers to pupil transportation; consequently, state action is primarily the responsibility of state legislatures. The Constitution of the United States is the basic law of the land. All statutes passed by Congress or the state legislatures, ordinances of local governmental units, and rules and regulations of boards of education are subject to the provisions of the Constitution of the United States. The Constitution covers a wide area of powers, duties, and limitations, but at no point does it refer expressly to education. Thus, education becomes a state function under the Tenth Amendment.

The Tenth Amendment to the Constitution of the United States holds, in part, that powers not delegated to the United States government are reserved to the respective state governments. Since responsibility for public education is not directly addressed by the Constitution, it becomes, by default, a responsibility of state government (Alexander and Alexander, 1992).

The Tenth Amendment has also been interpreted to mean that the power of local government is awarded or withheld at the discretion of its respective state government. Judicial precedent has established that such power may be awarded either explicitly or implicitly through the language of state law, but it may not be presumed to exist through the absence of restraining language. Without such explicit or implied granting of power, then, local governmental units are restrained from the exercise of power. More pointedly, a local governmental unit may neither raise nor expend funds in a manner not explicitly or implicitly sanctioned by its state government (Alexander and Alexander, 1992).

In 1869 the legislature of Massachusetts passed the first act which authorized local communities to tax themselves for the transportation of pupils. Johns indicated that this act gains importance because it establishes pupil transportation as "a legitimate part of the community's tax program" (Johns, 1928). Thus, 1869 may be taken as the year in which pupil transportation began to be regarded as a public rather than a private responsibility. This concept spread, and currently all fifty states have statutory provisions which place the transportation of pupils by public support upon either a permissive or mandatory basis.

Transportation was not always thought of as an implied function of the legislature. In 1907 an Indiana parent found he could not compel the school board to furnish educational facilities for his son or to transport him to a school. In the earliest cases, statutes in Arkansas and Iowa gave powers to a consolidated district to transport children of the district. In 1930 a Kansas case Foster v. Board of Education broke with tradition and allowed a local board of education, without specific legislative authority, the right to transport a Negro pupil under an act creating new districts for community high schools.

The legal basis for present policy in pupil transportation originates from statutory authorizations for specific services to be provided to local administrative units. A summary of services most frequently mentioned in the state legislative enactments provides a convenient checklist for future legislation. State departments are required:

1. To administer state funds for transportation;
2. To establish operating rules and regulations;
3. To advise or consult with local educational agencies;
4. To prescribe records and reporting forms;
5. To publish and enforce standards for buses and drivers;
6. To require local educational agencies to provide transportation;
7. To train bus drivers;
8. To coordinate inspection of school buses with other state agencies;
9. To act as an administrative board of appeals; and
10. To collect and disseminate information on pupil transportation (Featherston and Will, 1956).

Featherston and Will (1956) found that state departments of education vary in the number of personnel assigned to work on pupil transportation from one person working part-time to more than forty persons. As this service has broadened, however, authorizations have tended to be inferred from general statutory provisions or to be limited only by rules and regulations of state and local educational authorities. When no specific statutory authority is evident, many state departments of education assume responsibility and exercise leadership or discretion through the authorizations implied by statutory allocation of funds and statutory responsibility for approval of reports from local educational agencies.

Another type of legal authority comes from the extremely general authorization to make rules and regulations necessary for the operation of public schools. The state of Delaware exercises authority from this type of general authorization because pupil transportation to schools is necessary in present land-use patterns and public housing developments.

States are responsible for education. The equalization of opportunity within political boundaries can be accomplished partially by passage of transportation statutes. State legislative action reflects the school transportation needs and, conversely, the development of the busing system can be regarded as a response to legislative stimulus.

The fifty states have generated fifty unique transportation systems. Uniformity exists particularly in traffic laws and school bus standards which refer to mechanical equipment. Other aspects of bus programs usually covered by state regulations are the training of bus drivers, fleet inspection of vehicles, and a host of detailed activities under the heading of operational regulations. The conceptual design of a state's transportation is responsible for determining who shall be bused and for what purpose. Local bus systems are theoretically allowed to develop in a manner best suited to district conditions while at the same time insuring the educational rights of each child.

Once the legal issue had been settled, pupil transportation programs were to become an indispensable aspect of public school programs. Its evolution, however, was sluggish during the years prior to the development of motor vehicles. As late as 1920, the horse-drawn wagon was the vehicle most frequently used for pupil transportation (Latta, 1969). It was not until the twenties that the shift to the motorized school bus began to occur. The development of pupil transportation has closely paralleled the evolution of motor vehicles and the development of our road system.

In 1920 only 356,000 pupils, or 1.7 percent of the total school enrollment, were transported at public expense (Buehring, 1960). During the next thirty years, pupil transportation costs and ridership increased and by 1950-51, seven million pupils were served at a cost of approximately 200 million dollars. During the next seven years, the number of pupils transported increased to 11.3 million riders, which represented more than 32 percent of public school enrollments (Buehring, 1960). In 1976, 22,757,316 pupils, or 55.1 percent of the total public school enrollment, were transported at public expense (Dearman and Plisko, 1979). During the 1978-79 school year, 22,882,191 pupils were transported at a cost of $3,341,035,199 according to the school bus statistics released in the School Bus Fleet in January 1981. More recent figures indicate that in 1990, 22,473,662 pupils were transported at a cost of $7,604,001,899 (School Bus Fleet,1992).

Table 3 displays the number of pupils transported, the total number of buses used, and the expenditures for all states during the 1989-90 school year. New York had the largest and most expensive pupil transportation program. Alaska transported the smallest number of students and used the fewest buses.

TABLE 3

Statistics on School Transportation
1989-90

State	Number of Enrolled Pupils Transported at Public Expense	Total Number of Buses	Expenditure of Public Funds for Transportation Including Capital Outlay
TOTALS	22,473,662	369,168	$7,604,001,899
Alabama	440,941	7,289	97,105,577
Alaska	45,136	685	24,482,400
Arizona	217,435	3,769	-
Arkansas	275,644	4,420	61,136,151
California	1,054,759	23,044	755,849,888
Colorado	240,287*	4,474	72,200,849
Connecticut	334,613	5,562	150,072,520
Delaware	84,153	1,287	27,660,286
Florida	791,592	12,732	355,397,207
Georgia	887,000	11,402	198,720,000
Hawaii	38,750	817	20,073,700
Idaho	108,362	2,280	24,058,082
Illinois	956,407	8,749	353,682,226
Indiana	659,149	10,422	227,179,643
Iowa	229,097	7,159	71,201,325
Kansas	176,561	6,136	87,759,555
Kentucky	443,399	8,413	116,349,094
Louisiana	536,735*	7,244*	-
Maine	171,156	2,625	47,403,195
Maryland	465,579	5,534	214,455,878
Massachusetts	558,660	0	208,018,945
Michigan	759,186	14,570	349,402,473
Minnesota	1,016,791	10,876	203,595,788
Mississippi	389,090	5,321	64,937,265
Missouri	437,297	11,073	163,844,025
Montana	59,553	1,362	17,517,780
Nebraska	269,861	3,975	46,984,513
Nevada	63,640	1,118	37,566,308
New Hampshire	127,000	2,000	-
New Jersey	641,825*	14,299*	-

TABLE 3 (continued)

State	Number of Enrolled Pupils Transported at Public Expense	Total Number of Buses	Expenditures of Public Funds for Transportation Including Capital Outlay
New Mexico	138,523	2,181	58,056,381
New York	1,900,000	28,279	1,148,749,502
North Carolina	671,952	13,231	164,206,098
North Dakota	45,757	1,580	22,609,354
Ohio	1,217,643	13,425	350,986,703
Oklahoma	297,733	6,753	74,442,510
Oregon	221,362	4,749	86,232,184
Pennsylvania	1,158,769	21,456	513,622,478
Rhode Island	103,000*	1,425	-
South Carolina	437,615	5,568	67,135,923
South Dakota	44,978	1,721	19,448,211
Tennessee	538,607	8,209	88,758,584
Texas	1,087,293	26,481	303,303,430
Utah	145,669	1,727	27,423,499
Vermont	71,567*	1,846*	16,657,688*
Virginia	752,655	12,346	213,964,904
Washington	394,683	6,762	150,297,786
West Virginia	251,867	3,596	84,438,271
Wisconsin	472,622*	7,490*	191,388,042*
Wyoming	36,538	1,558	25,625,678

* Denotes state failed to reply to survey so previous year's information was entered.
- Denotes information was not available.

Source: December/January 1992, School Bus Fleet, Annual Fact Book, Bobit Publishing Company, Redonda Beach, California.

FISCAL MODELS USED IN FUNDING PUPIL TRANSPORTATION

States have experimented with various fiscal models for distributing pupil transportation funds. Variations in the models developed include the Morrison Theory of total state funding, the Strayer-Haig Theory of uniform local effort, and the Updegraff Theory of financial incentives for increasing local financial effort (Stollar and Tanner, 1978). Barr (1960) grouped the early developers of pupil transportation formulas into two groups: those concerned with measures of need and those concerned with measures of fiscal ability.

The early work of Mort, Burns, and Johns used population density as an independent variable in the assessment of school transportation needs and cost analysis. In 1924 Paul L. Mort did the pioneer work in this field. He developed a method for predicting the educational needs of a district as a basis for the equalization of educational costs and the distribution of state funds. He contended that the factor of density of population could be used as a predictor of the need for pupil transportation in his landmark work, Measurement of Education Need. He analyzed all educational costs and divided them into two discrete categories. The first group contained those cost figures which would be constant and equal for all classroom or teacher units. The second group included those costs for special services not uniformly required by all local boards or state legislatures. Transportation costs were included in this category.

Although Mort presented no plan for funding pupil transportation costs, he did suggest two possible approaches to the problem. His first suggestion was to consider all rural school population as if it were attending a one teacher school. His underlying assumption was that transportation costs of rural consolidated schools would be larger than the one room schools they replaced. However, Mort also pointed out that the one room schools had a greater need and should, therefore, be allotted a greater weight in relation to financial entitlement. This scheme resulted in more state funding going to the consolidated rural schools for transportation expenditures.

The second suggestion made by Mort involved the measurement of transportation need based on previous actual expenditures. Since all of Mort's group two costs were based on density, the density factor was indirectly included in his computation simply by transportation costs being designated in his second category of expenditures. Mort suggested that further research be conducted in the area of school transportation, developing an index capable of measuring transportation costs.

Robert L. Burns, in 1927, built upon the work of Mort and developed an index for measuring school transportation costs.

He contended that many variables contributing to transportation costs could be summarized in index form. He sought to find a variable which was not susceptible to local manipulation. Burns developed an objective formula which included the number of pupils transported, the average daily attendance, the district area, and the number of schools.

In 1928 Johns statistically studied this same problem of density of population as a measure of pupil transportation need. He used the average daily attendance in each county per square mile of area as the definition of density. Johns sought an objective and equitable means by which the costs of pupil transportation could be shared by the state and local districts.

Lambert, in 1938, completed one of the most comprehensive studies in the field of pupil transportation. He analyzed the works of Johns and pointed to grave errors which he contended existed in this work. He developed many factors other than density of population which he contended affected the needs for pupil transportation such as: distribution of towns and populations, given maximum walking distances for pupils, and peculiarities of topography. The major contribution of Lambert was his development of techniques to effectively make and determine policies and many other items important in the establishment of pupil transportation services.

Morphet (1961) evaluated Lambert's attack on the use of density of population as a factor in measuring pupil transportation need. He pointed to the plans then in operation in Alabama, Florida, Ohio, and Oklahoma as evidence that Lambert's objections had been met and that density of transported population was the most important single factor in a plan for apportioning state funds for pupil transportation.

Clayton D. Hutchins (1948) had studied the problem of determining the need for pupil transportation in Ohio in 1938. Hutchins and his associates had developed a list of 30 factors that affected the need for pupil transportation. These factors were then classified into two groups: (1) those not under the control of the board of education and (2) those which were under the control of the board of education and were largely matters of policy. He used the uncontrollable factors to determine the proper cost of pupil transportation for each district. He then used the controllable factors to adjust the basic amounts as "rewards and penalties for desirable or undesirable policies of management" and as "corrections essential to the determination of a cost which is fitted to the program established by the local district." He used the number of pupils transported, the density (number of pupils per mile of bus route or the number of pupils residing in a square mile) of transported pupils, and the road conditions as factors related to transportation expenditures.

William P. McClure, in 1948, developed a single measure (sparsity factor) based on the land area of a county and the average daily attendance of pupils. He found density is a good measure for predicting cost. Per pupil costs were higher in those districts with fewer pupils per square mile. Although road conditions also were surveyed, his study failed to find an objective measure which could be cost predictive. McClure emphasized the importance of state consideration of those factors beyond local board control when developing a funding formula. Francis G. Cornell and others, in 1949, used density of dwellings per square mile and concentration of population as a measurement of transportation need.

Barr (1960) cited Gerichs and Wells as advocates who used various measures of local taxpaying ability as a basis of equalizing pupil transportation support. Gerichs and Wells, who conducted several Indiana studies, were instrumental in changing the Indiana transportation formula so that it included both a sparsity factor and a fiscal capacity factor. The state grant-in-aid varied directly with sparsity of pupils and inversely with the fiscal capacity of the school district.

Featherston and Culp (1965) grouped the various methods of determining the state's share of transportation costs into four categories: First, the local entitlement is based on a fixed amount for each pupil transported; second, the local entitlement is based on part or all of the cost of transportation, usually with specific limitations; third, the local entitlement is based on the average pupil transportation cost of local school divisions over several years; fourth, local entitlement is based on a formula containing factors that have a relationship to variations in the cost of transportation.

Stollar and Tanner (1978) presented and critiqued six models for financing pupil transportation in their Indiana study. Model one, no state aid for pupil transportation, discriminates against districts with a scattered population and high transportation costs, retards school consolidation, penalizes the district which has significant needs for pupil transportation, and retards the equalization of educational opportunity.

Model two, a state flat grant per pupil regardless of the various conditions in the district, depends on how near the flat grant approaches the average cost of transportation in the state. Since such costs may vary from district to district, this model discriminates against the district with high transportation costs and rewards a district with lower costs. There are two variations of this model. The state pays all of the flat amount guaranteed, or the state and local districts share in providing for the flat amount guaranteed. The local share of the flat amount is in proportion to the district's financial ability, which tends to equalize the cost (Burnett, 1981).

Model three, full recognition of the varying costs of transportation beyond the control of the local board of education (density, wage levels, and related factors), is a major improvement over model two. However, to be fully equitable, the state formula must provide the full necessary cost of student transportation as determined by an equitable formula. It eliminates the inequities among districts due to variations in the percentage of the students transported and the costs per student. However, if the full necessary costs of transportation are not provided, the formula is inequitable to the extent that it does not provide for the full cost. This program encourages efficiency, because any transportation funds saved from the transportation allocation can be used for other purposes. This model has two variations: transportation costs are included in the foundation programs, and the costs are shared by the state and the local districts according to some type of equalization formula; or, the state pays the entire cost of transportation (Burnett, 1981).

Model four, state ownership and operation of the transportation system, provides for the equalization of transportation costs. It has the advantage of providing the same standard of service for all districts. However, decisions involving transportation would be removed from the local level and placed at the state level. Many authorities consider this to be an important disadvantage (Burnett, 1981).

Model five, state payment of the entire approved cost of transportation, as in models three and four, has the advantage of equalizing transportation costs. The state could pay the entire cost or share the cost with local districts in accordance with an equalization formula which considers the taxpaying ability of the local school district. This model had the disadvantage of removing transportation decisions from the local level and creating a state transportation bureaucracy (Burnett, 1981).

Model six, state payment of a fixed percentage of pupil transportation costs, places decision making at the local level. However, the percentage of transportation costs paid by a district is unequalized under this formula (Burnett, 1981).

Jordan and Hanes (1978) collected data and isolated the factors used by states to calculate the distribution of state transportation funds. They listed the following factors used by states in distributing state aid for transportation in 1978: flat grant, transported pupils per square mile, transported pupils per bus route mile, assessed valuation, and per pupil expenditures. They found that expenditures per pupil appeared to be the most frequently used criterion in determining the amount of funds allocated, and efficiency or the average cost factor appeared to be in effect in nineteen states.

The average cost concept utilizes the density of pupils and the average expenditures per pupil for transportation in each school district as the basis for calculating the allocation (Jordan, 1978). School districts with the same density index would receive a proportion of their predicted cost. If the actual expenditures of a school district were less, the balance of the funds could be used for other purposes, and the district would thereby be rewarded for its efficient operation of the transportation program. However, if the actual expenditures exceed the predicted costs, the district must provide the difference.

Density has appeared in the literature and research as the key predictor variable of cost in the area of school transportation since its introduction. It is easy to ascertain some measure of density and it has been credited by many to have the highest correlation with cost per pupil expenditures.

A density/cost efficiency model, recommended in a West Virginia study, provides for equitable treatment of school districts with varying socioeconomic and geographic conditions by adjusting for the single most important nonmanipulative factor (density) associated with variations in noncapital outlay cost per pupil among districts (Alexander, 1977). The curvilineal line of best fit between cost and linear density should be computed annually. Also, efficiency indices for all school districts are computed by dividing predicted cost per transported pupil by actual cost (Alexander, 1977).

The density/cost efficiency concept provides a direct monetary incentive for efficiency in local transportation management. Since funding is based on average costs adjusted for density, districts with expenditures above the average level represented by the density/cost efficiency curve are reimbursed for a lower proportion of costs than districts whose efficiency is above average. Districts whose costs are well above or below predicted levels are identified. State assistance could be offered to districts whose pupil costs are well above the predicted level to identify possible inefficient practices. Districts with costs well below average could be checked to verify that the service is adequate (Burnett, 1981).

FACTORS AFFECTING PUPIL TRANSPORTATION COSTS

Adequate funding and responsible management practices are vital to the effective and economical operation of a transportation program. As legislative bodies continue to tighten the school purse strings, school administrators must employ effective managerial practices in order to reduce costs without reducing services. This component examines some managerial practices recommended by various authorities in the field of pupil transportation.

Ernest Farmer (1987) stated that one of the objectives of pupil transportation was the need to operate the transportation program as efficiently and economically as possible. Over the last ten years, economical operation of a transportation program has become increasingly difficult to accomplish. Transportation supervisors have experienced a 300 percent increase in the per gallon cost of gasoline, a 135 percent increase in repair parts, over a 100 percent increase in driver salaries, approximately a 100 percent increase in the cost of buses, and insurance costs have risen by 65 percent in the rural areas and as much as 100 percent in many urban districts (Farmer, 1987).

Variations exist among the states in the amount spent for pupil transportation. The total expenditures for pupil transportation are closely related to the number of pupils involved. Some states convey more than 50 percent of their pupils, while others transport only slightly more than 11 percent (Featherston and Culp, 1965). The percentage of pupils transported appears closely related to the extent of urbanization in the state as well as the size of administrative units and attendance areas. States with many large urban centers usually do not transport as large a percentage of students as states with extensive rural areas. However, states which are predominately rural with small administrative units and attendance areas do not transport a high percentage of pupils.

Some factors affecting pupil transportation costs are beyond the control of the local school district, while others can be controlled or influenced by the local board (Featherston and Culp, 1965). Some school districts must pay more for student transportation than others, due to factors beyond their control (Johns, 1928). State formulas include one or more factors related to costs, such as the number of pupils transported, density of transported pupils, road conditions, the number of buses used, bus miles traveled, and capital depreciation factors.

Several decades ago, road conditions had some effect on transportation costs, but at the present time this has ceased to be a significant factor beyond the control of the school board which affects transportation costs (Johns, 1978). With the exception of the number of pupils transported, the factor most often used in computing local transportation needs is the density of the pupils to be transported, which is clearly beyond the control of the local board (Johns, 1978). It has been recognized that the transportation costs per pupil varies widely among districts due to variations in the density of transported pupils.

The pioneer work in this field was done by Mort in 1924. He developed a method for predicting the educational needs of a district as a basis for the equalization of educational costs and the distribution of state funds. He realized that local communities have unusual expenditures for meeting general requirements due to causes over which a local community has little or no control. This concept required a consideration of transportation costs in sparsely settled communities. He contended that the factor of density of population could be used as a predictor of the need for pupil transportation.

Burns, in 1927, developed an index for transportation needs which he suggested as a basis of the measurement of the state's minimum program of transportation and proposed a scheme for distributing aid for transportation on the basis of his index. His assumption was that sparsely settled communities transported children longer distances on the average than densely populated communities, and that due to this, the per pupil cost of transportation was higher in the sparsely settled communities than in the more densely settled towns and cities.

Burns then developed a mathematical relationship that predicted the transportation need in each county. He proposed that if a county was spending less than the minimum for transportation, the states should assume the entire cost of transportation in that county. If the county was spending more than the minimum, then the state would only pay the minimum amount and the local community would make up the balance of the cost. He concluded that the density of school population is a valid criterion for predicting per pupil transportation costs.

Johns (1928) felt that the inclusion of the density of the school population can be used as an independent variable to predict cost and was necessary to make Burns' formula practical. In a study of five states, Johns found that a county could have a low overall population density but have most of its population in a few centers; thus, its transportation needs would be relatively small as compared with agricultural counties of the same density that do not have population centers. Using this relationship, he found a high association between cost per pupil and average daily attendance per square mile.

Other studies were done to examine cost factors and to suggest ways for states to pay for transportation costs. Kern Alexander, in his 1977 West Virginia study, examined the relationship between pupil transportation costs and density of transported pupils, road conditions, wage rates, dispersion of school buildings and economies of scale to determine if these factors may result in variations among districts on necessary cost per transported pupil. Statistical analysis of these factors indicated that linear density was the best predictor of noncapital outlay cost per pupil and the relationship between cost and density in West Virginia was curvilinear with cost diminishing as density increases.

Borrowing from Burns, Johns, and others, McKeown in 1978 developed a formula predicting transportation efficiency in Illinois school districts' pupil transportation programs. Factors relating to differences in transportation costs were analyzed. These included the number of students transported, total bus miles traveled, area of districts, and the cost to transport eligible pupils between home and school. Variables were constructed from these data items and included the cost per eligible pupil, the cost per bus route mile, area density, and linear density. She found that one common characteristic of efficient districts was the use of staggered school hours or used multiple bus routes. Her composite of least efficient districts was a small, elementary district that contracted for transportation service and did not use staggered school hours or multiple routes since it was so small. There was little relationship between any of the factors and transportation cost except between the cost per bus route mile and linear density. The use of cost per bus route mile for use in the Illinois formula was discarded even though the correlation between the independent variables and the cost per bus route mile was very high. The number of bus miles traveled was considered a factor which was very susceptible to manipulation at the local level. Consequently, the use of this as a predictable variable in a formula to determine reimbursement for transportation costs would be inappropriate (McKeown, 1978).

In his Tennessee study, Johns (1978) indicated that the density of transported pupils is about the only factor beyond the control of local school boards which significantly affects transportation costs. Likewise, in his 1979 Florida study, he reached the same conclusion and stated that a state formula should provide for variations in per student transportation costs due to factors beyond the control of local boards, and density of transported students per bus mile is the principal noncontrollable factor causing variations in student transportation costs.

Johns and Alexander (1971) refer to the lack of development and funding of state finance formulas with correction factors for transportation arising from sparsity of population. They contend that there are several determinants of transportation costs which have either been ignored or treated inadequately in state finance plans, and the degree of sparsity is a major one.

The density of transported students can be measured in terms of students per lineal mile of bus route or by the density of transported students per square mile. Johns'(1978) Tennessee study concluded that density measured by transported pupils per lineal mile of bus route is a better measure than density of transported pupils per square mile.

Featherston and Culp (1965) agreed that density expressed as the number of miles of bus travel necessary for each student transported is considered to provide a more accurate picture of the transportation burden of a local school district than by computing the number of pupils per square mile.

Chambers (1978) separated transportation expenditures into endogenous and exogenous components. Endogenous components (within district control) included number of pupils transported by private carriers and mileage traveled per pupil transported. Transportation expenditures considered to be outside the decision-making control of the district were pupil density, road conditions, and costs of living and insurance.

In attempting to develop an educational cost index, Chambers (1978) identified three variables: (1) teacher's salary, (2) administrator's salary, and (3) transportation costs. The index of transportation costs was based on the variations in transportation expenditures across districts caused by the variables outside district control, while the variables within district control were held constant. In order to make the calculations of cost differentials, Chambers had to select some standard set of endogenous transportation characteristics. He selected the average costs of all the school districts in the sample. This allowed him to measure how much a school district was willing to spend on factors outside their control when endogenous factors were held constant.

In a study of transportation costs in Missouri schools, James Bliss (1983) developed a cost efficiency index which would match like districts and allow a comparison of transportation costs. Bliss compared cost factors such as per-average-daily-transported and per-mile cost. He discovered that the Missouri reimbursement system actually fostered mismanagement. Contracted services were more expensive and received a higher rate of reimbursement. Districts were being punished for owning their own buses and operating them at a savings to the state.

Lee Comeau, in 1982, stated that a district should look first at its local policies when analyzing the costs of a pupil transportation program. Decisions about owning or contracting for transportation, eligibility for service, and scheduling school starting and ending times, were all critical in planning for efficiency in pupil transportation.

According to a 1982 article by Lewis, school districts were having the most significant success in two areas: the use of computers and board ownership of buses. She also stated that districts which own a fleet of buses are reporting considerable savings as a result of programs involving fuel conversion, driver training and maintenance.

Johns, Morphet, and Alexander (1983) concluded that the best method for determining an equitable allotted cost per pupil transported was to use a mathematical formula for that purpose. They proposed that the mathematical formulas must accurately depict the relationship between two variables: cost per pupil transported and density. They noted that some state formulas contain other factors such as road conditions and topography, but that those factors have only a very slight effect on variations in cost per pupil transported in most states.

EQUALIZATION OF TRANSPORTATION COSTS

The equalization of transportation costs is a product and concern growing out of the large issue of equalization as it applies to the general funding of public education. The equalization movement started somewhere around the turn of the century and has become a measure of educational efficiency and effectiveness.

The early works of Cubberley in 1905 and Updegraff in 1921 introduced concepts of state school support. Cubberley proposed that it was the state's responsibility to establish schools and maintain minimum standards through the. . . "apportionment of state funds . . ."equalizing". . .the advantages to all as nearly as can be done with the resources at hand. . ."(Johns, 1975). Updegraff built on many of Cubberley's concepts and proposed that "the purpose of state aid should be . . . to guarantee to each child. . . equal opportunity to that of any other child for the education which will best fit him for life (Johns, 1975)."

Strayer and Haig were the first educational theorists to speak in terms of the concept of "equalization of educational opportunity" (Johns, 1975). Their work, The Financing of Education in the State of New York set forth theoretical concepts which have had a major impact on current educational planning and policy formation (Jordan, 1976). Strayer and Haig point out that in order to carry out the principle of "equalization of educational opportunity," it would be necessary:

> 1. To establish schools or make other arrangements sufficient to furnish the children in every locality within the state with equal educational opportunities up to some prescribed minimum.
>
> 2. To raise the funds necessary for this purpose by local or state taxation adjusted in such manner as to bear upon the people in all localities at the same rate in relation to their tax-paying ability.
>
> 3. To provide adequately either for the supervision and control of all the schools, or for their direct administration by a state department of education (Jordan, 1976).

Mort built upon the work of Strayer and Haig, expanding on many of their basic concepts and formulating minimal standards by which to evaluate school programs. In 1933 Mort tied pupil transportation to the growing concern over educational equality when he wrote:

> For many years political subdivision have provided for the transportation of pupils to and from the public schools. This service has been paid for from public funds and has been regarded generally as a part of the necessary cost of providing adequate educational facilities. With the demands for the equalization of educational opportunity, and increased state participation in the maintenance of a minimum public school program, the legal provisions relating to pupil transportation have increased correspondingly.

Mort (1924) recognized the variation in transportation costs among districts and spoke of the importance of developing a method of funding which would more closely equalize the educational expenditures related to the transportation of students.

Thurston and Roe (1957) in State School Administration expanded on Mort's statement when they wrote:

> By 1919 all states had passed legislation which authorized the use of public funds for pupil transportation. This legislation for the most part was of the permissive variety. Today one may look back and see an evaluation of legislation which is inclined to require transportation and recognize it as a necessary service in equalizing educational opportunity for every American child.

The research which followed in the 1930's and 1940's was concerned primarily with establishing a relationship between cost factors and program quality (Hanes, 1976). Nash (1978) reports that "these studies consistently strengthened the presumption that a strong positive relationship existed between expenditures and the quality of the educational program and the degree of equality of educational opportunity provided." These early studies of educational finance uncovered the wide disparity which existed between districts in terms of both programs and dollars available to students. Terms like "equal educational opportunity" and "equalization" were being used by educators and legislators alike. The "school finance reform movement" had begun.

CRITERIA FOR EVALUATING STATE PUPIL TRANSPORTATION PROGRAMS

States have been experimenting with various methods of funding pupil transportation during the past few decades. However, Serrano-type litigation and the dramatic increases in the costs for transportation have caused a number of states to revaluate their pupil transportation programs. As a result of such studies and related research, certain criteria have evolved for the evaluation and development of state pupil transportation programs (Burnett, 1981).

In their landmark work, Pupil Transportation, Featherston and Culp (1965) discuss at length those evaluative criteria for state transportation financing they have isolated as being essential for consideration.

Their first criterion for the evaluation of state aid formulas for pupil transportation asks if a particular plan has accounted for legitimate factors which have affected the total transportation cost. Economic, social, or geographic inequalities must be eliminated from the formula.

A second criterion emphasized that a state aid formula should be simple as possible, yet maintain accuracy. Simplicity allows for more accurate projection of local district entitlements, while eliminating clerical work at both the state and district level. Featherston and Culp cautioned that simplicity should not be overemphasized at the expense of accuracy.

The third criterion is that a state aid formula must not be susceptible to local manipulation. The local school unit must not be able to control or manipulate the factors in the state formula. If a local district can control funding variables which affect its reimbursement, then reduced efficiency can result.

The fourth criterion states that certain aspects of state allocations for pupil transportation should be based on past experience. Featherston and Culp felt the use of state average costs for some facets of transportation funding will promote efficiency of operation.

The fifth criterion states the importance of the state plan being objective as possible in the assessment of local need. Once state guidelines and standards are established, they should be applied to local districts equally unless extreme hardships result. Featherston and Culp did point out that in some local districts the need may be so different from state requirements that subjective judgments will be needed to achieve equal treatment for the students of that district. A state plan should never be so structured that policies providing for extreme situations are not included.

The sixth and last criterion emphasizes that the state formula should promote efficiency of operation on the part of the local unit. The application of state average costs, requiring state program approval, and monitoring local programs are three methods of promoting efficiency of operation.

In a national study of pupil transportation services, Stollar, in 1971, used a set of criteria to judge the quality of a transportation program. His basic criterion was that any state transportation formula must take into account the factors which cause a considerable variation in the justifiable costs of the service. The density of transported pupils, road conditions, and local wage levels are examples of such factors (Burnett, 1981).

Stollar's second criterion evolved from the need for simplicity in the pupil transportation formula. Simplicity may be necessary due to the level of accounting utilized by the local school districts and state departments of education. The formula should provide for varying costs between districts if these costs can be accurately determined. With a simple formula, calculations are simplified, record keeping is reduced, and clerical staff may be reduced (Burnett, 1981).

His third criterion was that the factors in the state transportation formula cannot be manipulated at the local level. If a state uses such factors as number of buses, the number of bus or pupil miles traveled, or number of pupils transported, the state must exercise sufficient authority through standards, supervision, and auditing to prevent abuses (Burnett, 1981).

Stollar's fourth criterion concerned the computations of allocations based on past experience. He suggested that if a formula is based on past experience, the experience may have been based on inefficient operations and the resulting cost would be unnecessarily inflated. However, if averages are used for determining the prevailing conditions, the inefficient school district will be penalized, thereby encouraging it to strive for greater efficiency (Burnett, 1981).

His fifth criterion was the need for a state transportation program to be as objective as possible. While recognizing that some subjective decisions cannot be avoided, he suggested that decisions at the local and state levels should be within specified policy guidelines (Burnett, 1981).

Johns, in a 1977 Florida school transportation study, presented the following features necessary for a desirable transportation formula. First is an equitable distribution of state funds to provide transportation for all pupils who need transportation. Second is sufficient funds to provide a safe, efficient, adequate and economical pupil transportation program. Third is a relatively easy adjustment to compensate for inflation. Fourth is a simple formula with limited steps in computing funds for the local districts. Fifth is full state funding of the defensible costs of pupil transportation.

In his 1978 Tennessee study, Johns made one change in the desirable features of a state transportation formula. He deleted the full state funding of defensible pupil transportation costs and substituted as a desirable feature the provision for variations in transportation costs per pupil due to factors beyond the control of boards of education. He indicated that there should be no provisions for variations in per pupil costs due to factors which boards can control.

The New Mexico State Department of Education (1964) developed a list of criteria for evaluating state transportation financing:

1. Provide sufficient state funds to enable the local unit, with reasonable local effort, to operate a safe, economical, efficient, sound, and practical system of transportation for all pupils who should be transported.

2. Tend to compensate for the additional burden that falls upon school districts which must provide pupil transportation. (Many school districts cannot assume additional costs from local sources).

3. Take into account provisions for capital outlay expenditures, such as purchase of school buses, school bus equipment, and safety equipment.

4. Provide for the amortization of capital outlay expenditures for school buses and equipment that meet state specification, beyond the current year (preferably a four-year period).

5. Tend to stimulate the attainment of desirable standards for school bus equipment, maintenance and operation, and the employment of qualified personnel.

6. Permit at the local level, ready flexibility in making adjustments in the transportation program, such as in cases of emergency increases in number of pupils, reorganization, or consolidation of schools, which require in most instances additional transportation.

7. Require the local school districts or local administrative units to maintain adequate accounting records and reports.

8. Provide for consideration of factors beyond the control of local units, such as population density, road conditions and geographical barriers.

9. Not tend to discourage desirable reorganization of local units and attendance areas.

10. Provide for distribution of all state monies for transportation on an objective formula:
    Capital Outlay
    Maintenance and Operation
    Drivers' Salaries

11. Encourage schools to broaden and extend the school program through the use of school buses, be they school-owned or contract buses.

12. Provide for subsistence for pupils in lieu of transportation, within reasonable limitations.

Bernd (1975) identified four major criteria suitable for evaluating state transportation programs. These were validity, reliability, objectivity, and efficiency.

Farley and Alexander (1973) used the following criteria to evaluate the Kentucky transportation program:

1. A state formula must take into account factors which cause variations in determining and justifying the cost of transportation services. They considered the density of transported population, road conditions, and the wage level of the area as factors causing cost variations.

2. The formula should be simple but take into account variations in cost between districts, providing such costs can be accurately determined.

3. The factors used in determining transportation costs cannot be manipulated by local school personnel.

4. State transportation programs should be as objective as possible.

5. A state transportation formula should promote efficiency in the local pupil transportation program. State department personnel must monitor local programs to insure that safe, adequate service is not sacrificed for the sake of economy.

According to Jordan and Hanes (1978), the following criteria are accepted as important considerations in the design of an equitable state support programs for school district pupil transportation programs:

1. Recognition of factors contributing to the variations in transportation expenditures among school districts: school programs, geographical variations, and pupil density differences.

2. Utilization of actual expenditures data in the development of the support level and the allocation process.

3. Recognition of the costs associated with transportation of different groups of pupils: regular, handicapped, and vocational.

4. Utilization of a rational calculation process that reflects simplicity, accuracy, and objectivity so that equality may be maintained among all school

districts in a state.

5. Utilization of a process that precludes the possibility of data manipulation by school district personnel.

6. Promotion of efficiency in the operation of school district transportation programs.(Jordan & Hanes).

Finally, from the West Virginia educational finance study:

> . . . generally recognized criteria for evaluating alternative methods of funding pupil transportation center around the critical concepts of adequacy of programs, efficiency in local transportation management, equity among districts with diverse socioeconomic and geographical conditions, and simplicity and objectivity in the administration of the funding mechanism (Alexander, 1977).

It is necessary for builders of pupil transportation funding formulae to reach a balance that neither ignores not gives excessive weight to any single criterion. According to Zeitlin (1990), no single funding method will ensure by itself that a state's pupil transportation goals are met, but success or failure depends upon the manner in which the funding formula is applied through appropriate reporting and auditing procedures.

A SURVEY OF CURRENT STATE PUPIL TRANSPORTATION PROGRAMS

There are as many variations in the methods of transportation aid reimbursement as there are states in the union. Some states provide no pupil transportation support while other states reimburse school districts for 100 percent of their approved transportation expenses.

Requests for pupil transportation information were mailed to all states in an attempt to review the funding plans and features of current state transportation programs. Information was received from the fifty states. The letter used to request information is shown in Appendix B.

Tables 4 and 5 were originally developed by Clyde Burnett is his dissertation, A Study of the Funding of Pupil Transportation in Virginia. These tables were updated to summarize the key characteristics of the various state programs. Some program characteristics were easily categorized while other program characteristics were unique to the state and did not lend themselves to easy classification. It was not uncommon for state funding plans to meet the criteria for more than one fiscal model. The information shown in Table 4 deals primarily with regular pupil transportation and does not attempt to include the special provisions for transporting handicapped pupils, vocational pupils, and the miscellaneous elements of state transportation programs.

Most of the headings used in Table 5 are self-explanatory; however, several fiscal models used as the basis for the allocation of state funds are defined to clarify their use. The equalization concept formula recognized the variations in pupil transportation costs due to factors beyond the control of the local board and attempts to equalize the distribution of funds by taking one or more of the following factors into consideration: linear density, area density, road conditions, geographic regions, assessed valuation, and variations in wage levels.

The percentage grant model provides for the state to pay a fixed percentage of the district's approved transportation costs. Nationwide, the percentage of state reimbursement averages approximately 80 percent and usually is based on the previous year's expenditures.

The flat grant model provides a fixed monetary value for one or more of the following factors: the number of students transported, bus miles traveled, number of buses used, and the size of buses used.

In the approved cost model, the state pays the district's entire cost of pupil transportation. Under this model, the local district's approved costs are usually closely controlled by state requirements and regulations.

Among the factors used in Table 5 to determine local entitlement, several need to be clarified. Linear density is the number of transported pupils per mile of bus route. Linear density is computed by dividing the total number of eligible pupils transported by the bus route mileage. It should be noted that states vary in the methods used to compute both eligible pupils and route mileage. For Example, Florida determines the bus route mileage by adding one-half of the round trip bus route mileage, one-half of the round-trip bus mileage between school centers for vocational and exceptional pupils, and 50 percent of miles traveled without pupils. In contrast, Indiana computes bus route mileage by doubling the total miles traveled from the first pickup point to the last point at which an eligible pupil disembarks at school. Another state, Utah, determines bus route mileage by totaling bus route miles with pupils plus half of the bus route miles without pupils.

Area density is the number of transported pupils per square mile and is computed by dividing the number of eligible pupils transported by the number of square miles of the area served.

TABLE 4

Factors Used by States to Distribute State Aid for Pupil Transportation in 1990-91

Factors	Frequency of Use
Expenditures	29
Number of Pupils	25
Bus Mileage	20
Size of Bus	10
Bus Replacement	10
Number of Buses	9
Assessed Valuation	10
Area Density	8
Bus Depreciation	7
Driver Salary/Bus Hours	8
Bus Insurance	4
Road Conditions	3
Linear Density	3
Geographical Regions	3

Source: Writer's survey of state pupil transportation

Table 5

Funding Characteristics of State Pupil Transportation Programs

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Alabama			X				x					x							x		2	2	The 67 counties are grouped into 11 density groups
Alaska		x		x							x								x		$1\frac{1}{2}$	$1\frac{1}{2}$	The state reimburses up to 100% of actual operational costs (including special education transportation), 90% of capital expenditures, and 50% of cost of hazardous route transportation
Arizona			x														x				1	$1\frac{1}{2}$	Transportation based on computations involving 25 per daily route mileage and total bus mileage.
Arkansas	x						x			x		x		x	x					[a]x	2	2	[a]The state provides aid for drivers and mechanics who attend workshops.
California	x						x			x	x		x	x	x			x	x		[c]$\frac{1}{2}$ [d]1	2	Districts may receive state transportation funds and, are currently numbered at an average rate of 50% of their annual transportation expenses.
Colorado		x	x														x		x		b	b	Entitlement on a flat grant per mile and 20% of any amount by which district's expenses exceed the per mile entitlement
Connecticut	x	x	x							x		x							x		[c]1 [d]$1\frac{1}{2}$	2	Entitlement computation varies with type of board (local or regional). Within town transportation entitlement based on 50% of total cost (not to exceed $30 per pupil)

Table 5 (continued)

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Delaware	x			x	x				x												1	2	The maximum reimbursement is the amount computed on the basis of an approved district operated formula or a contract formula.
Florida	x					x						x					x				2	2	Appropriations (has always been) less than 70% of total statewide cost.
Georgia	x		x						x		x			x	x	x	x	x	x		$1\frac{1}{2}$	$1\frac{1}{2}$	Allocations are based on information established by surveys conducted by the state transportation staff
Hawaii					x																b	b	Pupil transportation is fully state funded and operated.
Idaho	x	x	x							x			x			x		x	x	[a] x	$1\frac{1}{2}$	$1\frac{1}{2}$	(a) Administrative allowance entitlement is 85% of the difference between the total allowable cost and the estimated proceeds of a tax levy of one mill applied to the adjusted value of taxable property, but it shall not exceed $10 per month per transported pupil.
Illinois	x		x							x		x	x						x		$1\frac{1}{2}$	$1\frac{1}{2}$	The minimum claim for a district is the formula amount or $16 times the ADM of transported pupils, whichever is greater.
Indiana	x					x				x		x									1	1	An eligible kindergarten pupil is counted as one-half an eligible pupil for reimbursement purposes.
Iowa				x															x		2	3	Transportation funds are included in the State Foundation Aid Formula and vary according to the district valuation

Table 5 (continued)

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Kansas	x			x			x					x							x		$2\frac{1}{2}$	$2\frac{1}{2}$	Entitlement is 100% of the formula per pupil cost or 100% of the per pupil cost, whichever is lower.
Kentucky	x						x					x							x		1	1	The state is divided into nine density groups.
Louisiana			x												x		x	x			1	1	Entitlement is based on a minimum salary schedule for bus drivers, which varies according to the bus size and the mileage driven.
Maine		x								x	x								x		2	2	Depending on its "wealth" a district may receive up to 90% of total operating costs from the state.
Maryland	x		x					x				x		x	x	x	x	x	x	ax	e$\frac{1}{2}$ f1	$1\frac{1}{2}$	(a)State provides an administrative allowance which includes salaries, travel, and inservice. The age of the bus is also a factor in computing local entitlement. Density is also a factor; however, it relates to a trip mileage allowance.
Massachusetts			x	x								x							x		$1\frac{1}{2}$	$1\frac{1}{2}$	The state reimburses the district the full amount expended for regional school transportation. Cities or towns are paid the sums required for approved expenses in excess of $5 per annum per pupil in the net average membership of such town.

Table 5 (continued)

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Michigan		x							x			x		x			x		x		b	b	School bus depreciation and insurance are included as part of the district's allowable expenditures. The state reimburses on basis of the number of student receiving service.
Minnesota	x						x			x		x	x						x	[a]x	1	2	Factors red in predicting a district's cost include area of district in square miles, ADM, and the [a]percent of enrollment transported.
Mississippi	x		x				x				x	x									1	1	The allocation is based on an amount per pupil according to a density rate schedule for each school district.
Missouri		x										x					x		[a]x		1	1	A district receive an amount not greater than 80% of the allowable costs with a ceiling of 125% of the state average of the second preceding school year. [a] Bus depreciation and insurance are included in the total allowable expenditures.
Montana			x												x		x			[a]x	3	3	Entitlement is based on $ 80 per bus mile for fiscal year 1988 and $ 85 for fiscal year 1993. [a]Rate may be adjusted according to size of bus and percentage of ridership in relation to bus capacity.

Table 5 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	Factors Used to Determine Local Entitlement: State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Nebraska			x									x									4	4	Transportation reimbursement is included as part of the Equalization Aid. The reimbursement is based on a flat rate per pupil, and the amount varies with the grade level of the student transported.
Nevada		x																	x		b	b	Eighty five percent of the historic expenditures for pupil transportation is provided by the state. Actual expenditures for the previous two year period serve as the base.
New Hampshire																							There is no state aid for pupil transportation.
New Jersey		x															x		x		2	$2\frac{1}{2}$	In 1990 91 the state paid 90% of the district's approved transportation cost.
New Mexico	x		x					x			x		x	x	x		x	x	x	ax	g 1	h $1\frac{1}{2}$ i 2	The state has a formula for privately owned school buses and a formula for school owned buses. (a) Administration and supervision allowance.
New York	x																		x		$1\frac{1}{2}$	$1\frac{1}{2}$	The state pays 90% of approved transportation costs. A school district may not receive more than 107% of the transportation paid in the previous year; however, there are exceptions for excess transportation costs.

Table 5 (continued)

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
North Carolina				x								x					x			[a]x	$1\frac{1}{2}$	$1\frac{1}{2}$	[a] In effect, pupil transportation funds are allocated according to the needs of the school district.
North Dakota		x	x									x			x		x				b	b	The state pays a flat rate per mile and per pupil per day. The rate varies with the size of the bus
Ohio			x								x	x					x				1	1	Local entitlement is based on a flat rate per pupil or per mile, whichever is greater. The state has the same rate for board operated buses and contracted service.
Oklahoma	x	x					x					x									$1\frac{1}{2}$	$1\frac{1}{2}$	1978 79 Formula: Per capita allowance x average daily haul x 110% = state aid for transportation (114% for 1979-80).
Oregon		x																	[a]x		1	$1\frac{1}{2}$	The state pays 60% of the total approved transportation cost. [a] Bus depreciation and insurance are included in the approved cost total.
Pennsylvania	x		x							x		x	x	x	x		x	x	x	[a]x	$1\frac{1}{2}$	$1\frac{1}{2}$	The state uses two formulas: district owned and operated transportation and pupil transportation by contract. [a] The age of the bus and seating capacity is a factor in the contracted reimbursement formula

Table 5 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	Factors Used to Determine Local Entitlement: State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Rhode Island	x									x									x		1	1	Transportation expenses are a factor in determining state share ratios for calculating state aid annual entitlements and are included in total local expenditures for reimbursement.
South Carolina					x																$1\frac{1}{2}$	$1\frac{1}{2}$	The only cost to the local school district is for supervision.
South Dakota		x	x														x		x		b	b	The district entitlement is 50% of its net transportation cost but not more than $.30 per mile.
Tennessee			x									x								[a]x	c	$1\frac{1}{2}$	Sixty percent of the total state transportation appropriation is allocated on a per student basis. Forty percent is allocated on the basis of a ratio of the geographic area of each county to the total geographic area of the state, as computed in [(a)] square miles.
Texas	x		x					x						x	x		x				2	2	For 1978-79 and thereafter, the base cost reimbursement for each bus shall be 105.2% multiplied by the allowable total base cost for each bus during the 1977-78 school year. Percentage increases and reductions are allowed for road conditions and mileage which deviates from the standard state bus route.
Utah	x			x		x						x					x		x		$1\frac{1}{2}$	2	The state uses a regression equation formula to compute local entitlement.

Table 5 (continued)

	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		
State	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Vermont																							Vermont does not provide categorical aid for regular school transportation. Reimbursements are provided for transportation in connection with special education or vocational education services.
Virginia	X											x		x			x				1	$1\frac{1}{2}$	The state transportation appropriation is distributed as follows: 40% of the total on the basis of number of pupils transported, 40% of the total on the basis of miles traveled, and 20% of the total on the number of buses meeting state standards.
Washington		x									x	x	x				x	x	x		1	1	The reimbursement rate is calculated using total statewide reimbursable costs and total state transportation funds available. Under current regulations, this rate could not exceed 90%.
West Virginia		x									x					x			x		b	b	The transportation allowance is the sum of the following: 80% of transportation cost, exclusive of salaries; total cost of insurance; 10% of replacement value of bus fleet; 80% of cost of contracted and public utility service; and aid in lieu of transportation equal to state average per pupil.
Wisconsin			x									x								a_x	2	2	(a) Distance pupil transported.

Table 5 (continued)

State	Fiscal Models (Basis for Allocation)				Factors Used to Determine Local Entitlement																Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Wyoming		x									x								x		b	b	The state reimburses the district for 3/4 of total operation/maintenance cost and 1/6 of total cost for capital outlay for buses.
TOTALS	21	16	21	7	3	3	8	3	3	10	10	25	7	9	10	4	20	8	29	10			

Source: The writer's survey of current state transportation programs.

(a) Refer to the remarks column for explanation.
(b) There was no reference to eligibility distance cited in the information received from the state. Michigan has removed 1 1/2 mile eligibility requirement and each district determines their own eligibility.
(c) Grades K-3
(d) Grades 4-8
(e) Pre-kindergarten and kindergarten
(f) Grades 1-6
(g) Grades K-6
(h) Grades 7-9
(i) Grades 10-12

Transportation expenditures represent the transportation costs incurred by a local school district in providing transportation services to its pupils. The transportation expenditures are limited to current operation and maintenance costs; although, in a small number of states, transportation expense includes disbursements for capital outlay, bus depreciation allowances, and insurance premiums. States which include capital outlay and other costs in calculating their transportation expenditures are identified in Table 5.

Variations in wage levels of transportation employees, a component referenced in defining the equalization model, does not appear in the table, because the survey found no states using this factor in their distribution plan.

The state funding plans were categorized into one or more models: equalization, percentage grant, flat grant, approved cost, and state-owned and operated. However, very few states are utilizing the equalization concepts recommended in current research. Twenty-one states used one or more of the equalization factors and only three used linear density as a factor in distributing transportation funds. Of the other equalization factors, three states continue to use road conditions, two states use geographic regions, eight states use area density, nine states use assessed valuations, and no state uses the variation in wage levels as a factor in determining local entitlement.

In the amount of financial support provided for pupil transportation there are also considerable differences among states. The degree of support ranges from no state aid in New Hampshire, state-owned and operated programs in Hawaii and South Carolina, and seven states paying basically all of the approved cost of transportation.

The percentage grant model is involved in sixteen state programs; however, only ten of the sixteen states use the percentage grant as the sole method of distributing transportation funds. Of the ten states, the percentage grant ranges from a high of 90 percent in Maine, New Jersey, New York, and Washington to a low of 60 percent in Oregon. The average percentage grant for the ten states was 82 percent.

The flat grant model is used by twenty-one states. The number of students transported and bus mileage are the factors used most frequently with this model.

Table 4 indicates the various funding factors used by the states in 1990-91 to distribute state transportation aid and the frequency of use. Expenditures, number of students, and bus mileage were the most frequently used of the fourteen factors listed. Of the ten factors that did not fit a specific classification (other), three involved an administrative allowance for transportation.

Nineteen states include pupil transportation funds in the basic support program; and in some cases, the funds are not identifiable. Most states include pupil transportation funds in the pupil support services component of the budget.

Thirty-seven states have statutory provisions pertaining to minimum travel distance from school as a precondition for state aid. In twenty-seven states, a single minimum distance is used for all pupils; however, ten states maintain two or more distance requirements based on the grade level of the transported pupil. In four instances, states specify three distance requirements. The distance requirements range from a low of one-half mile for K-3 grades in California and pre-kindergarten and kindergarten in Maryland to high of four miles in Nebraska. Nationwide, travel distances average 1.5 miles for lower grades and 1.8 miles for secondary grades. A large number of states waive travel distance requirements for handicapped pupils and for students who are subjected to hazardous walking conditions.

The survey of current state pupil transportation programs revealed a wide variety of approaches in funding pupil transportation. An examination of the various methods used by the states to determine local entitlement for transportation resulted in the conclusion that many states use funding plans which are unduly complex and appear to provide little incentive for efficiency.

A trend toward efficiency-oriented, equalized funding appears to be developing. Several states, including North

Carolina have recently conducted transportation studies, and three states, including Utah have adopted new efficiency-oriented funding formulas using linear density as the major factor in predicting pupil transportation cost.

PUPIL TRANSPORTATION IN NORTH CAROLINA

In North Carolina, as in other states, pupil transportation began rather sporadically in isolated areas with the local government officials assuming the responsibility for providing transportation. North Carolina first permitted the use of public funds to pay the costs of transporting students to school in 1911 (Abel, 1923). Since then, such transportation has become a major enterprise of the educational process. By 1989-90, 13,231 school buses were transporting 671,952 pupils in North Carolina (School Bus Fleet, 1992).

The pupil transportation system of North Carolina is controlled entirely by statutory enactments. The State Board of Education, through the Controller and Division of Transportation, prepares budgets, requests legislative appropriations, and allocates funds to the various school administrative units. These allocations are based on needs identified through studies by the State Board (e.g., §115C-240).

Each county and city board of education is authorized to acquire, own, and operate buses for the transportation of persons enrolled in, as well as employed by, the public schools.

The school superintendent, under law, is responsible for general supervision over pupil transportation within the administrative unit. Subject to the approval of the school board, the superintendent of each unit, by statute, has the responsibility of assigning the buses owned by the administrative unit to the individual schools of the unit (e.g., §115C-240). Upon receiving the buses, the principal assumes the responsibility for providing the proper supervision of school buses (e.g., §115C-523).

Each board must use transportation funds appropriated to it by the State Board of Education for the purpose of maintaining and operating school buses in accordance with the law and for no other purposes. County and city boards of education, through administrative officials, assign buses to the various schools, supervise the use and operation of buses,and arrange for inspection every thirty days. Local boards of education also keep records of transportation operations and make yearly reports to the State Board of Education (e.g., §115C-240(e).

The cost of the school bus fleet is met through both local and state funds. School buses are purchased initially with local funds, and the title of each bus is vested in the local school board (e.g., §115C-240(e). The number of buses a school district will own and operate is strictly a local decision (e.g., §115C-249(e). However, once acquired, all buses, to the extent authorized by the laws providing for state aid to school transportation, are operated and maintained at state expense and are replaced by the state when damaged, destroyed, or worn out. The criteria by which damaged buses are repaired and old buses replaced are established by the State Board of Education (e.g., §115C-249(c),(f). The state also provides funds for the salaries of mechanics and drivers. The only other local expense in school transportation is that of erecting and maintaining storage and maintenance buildings, for which funds must be provided by the tax-levying authorities (the county commissioners) in the school units' capital-outlay budgets (e.g., §115C-249(e).

North Carolina districts receive direct aid from the state for the operation of buses owned by the local school district. Local districts purchase buses initially from local funds with approval of the state. Replacement buses, funds for the operation and repair of buses, and the employment of personnel are then provided by the state. The allocation formula is based largely on historical data and trend analysis of prior year maintenance and operating costs and adjusted annually based on fuel costs, personnel salaries, and adjustments in ridership. Because of the more frequent periodic fluctuations in ridership, special funds are allocated for the transportation of special education and summer school students based on local determination of need (Gold, 1992).

Local districts may but are not required to supplement driver salaries and fuel cost allocations. While districts can buy additional buses from local funding, the state must approve these purchases.

By law students must live at least 1.5 miles from school on state maintained roads to qualify for transportation to school. However, locally determined hazardous conditions may allow exceptions where needed.

Norfleet Gardner, chief consultant, and Doug White, consultant, transportation services of the North Carolina Department of Public Instruction, provided the following information regarding 1990-91 transportation funding for the school districts and information on the new funding formula. In North Carolina, in 1990-91, there was no precise formula used for allocating pupil transportation funds, however, the state did take into account the number of miles, and the number of transported pupils. The state assumed responsibility for the cost of transportation and funded the districts requests according to the money they had available for that year. In 1990-91, the State funded $144.2 million (4.4% of the PSF) for pupil transportation. State allotments, in 1990-91 ranged from 82.7% to 100% (Norfleet Gardner, personal communication, February 11, 1993.)

In 1992 the state contracted with the consulting firm of Ernst and Young to study the efficiency of local districts' transportation systems. For the school year 1992-93, the state revised its current funding formula to use a derived efficiency rating to adjust allocations to districts. Efficiency ratings will be based on such factors as local expenditure for transportation, ridership, miles driven, and "deadhead" miles traveled between bus stops (North Carolina State Board of Education, 1992).

The proposed funding formula for pupil transportation in North Carolina is quite different from the current one. Under the current funding process, Local Education Agencies (LEAs) may be operating inefficiently but still receive 100 percent of their funding requests. Under the new process, these LEAs will not be fully funded (North Carolina State Board of Education, 1992).

The proposed funding formula has been developed with the intention of achieving several objectives. The formula provides funding sufficient to meet state standards for adequate, safe, and reliable service. The funds will be sufficient because efficient performance will be determined on the basis of actual LEA performance. To be eligible for state funding, the pupil transportation service provided by the LEAs must meet or exceed minimum state service standards.

The formula provides incentives to operate efficiently since funding levels will be a direct function of operating efficiency. LEAs with a 100 percent efficient rating will receive funding equal to 100 percent of their pupil transportation budget needs and may receive financial rewards in excess of budget needs. Those with less than a 100 percent efficiency rating will not be fully funded. The proposed formula bases funding on the most efficient operations in the state. Thus, the incentive is to become one of the most efficient operators rather than one of the average operators in the state (North Carolina State Board of Education, 1992).

According to Ernst and Young, some LEAs are not now prepared to operate with less than 100 percent state funding. They may not have local funding to make up the difference between their budget estimate and their level of state funding, and they may not be able to determine how to reduce their pupil transportation costs in order to live within their state funding allotment (North Carolina State Board of Education, 1992).

Ernst and Young believe than in addition to determining how efficiently and LEA operates its pupil transportation service, the new formula also helps to identify why the LEA is inefficient relative to its peers. Thus, rather than leaving the LEAs to their own devices to grapple with the possibility of less than 100 percent State funding, the State will be able to direct each LEA to the aspects of its pupil transportation program causing the inefficiency. Again, peer comparison is used to make these determinations so that the direction provided by the efficiency formula is realistic--other LEAs are achieving these results (North Carolina State Department of Education, 1992).

The efficiency rating is not based solely on cost, however. It also takes into account the number of buses used to transport pupils.

The state of North Carolina has put together several "foundation systems" to support the provision of safe, reliable, and economical pupil transportation service. In addition, the implementation projects that are now being conducted provide for the development of additional management tools and training. Procedures are being prepared for the development of more accurate budgets, for financial management throughout the year, for operations and maintenance management, for the assessment of maintenance facilities and equipment, and for mechanic prequalification and training (North Carolina State Board of Education, 1992).

SUMMARY

This chapter reviewed the various fiscal models used in funding pupil transportation, the factors influencing pupil transportation costs, and the criteria for evaluating state transportation programs. Also included was the current status of state transportation programs throughout the country.

This chapter provided an explanation of North Carolina's pupil transportation program. In addition, laws governing the regulation and control of the pupil transportation program in the state are presented.

This chapter has reviewed the literature on state support for pupil transportation. The literature reviewed on the evolution of state aid indicated that requirements for pupil transportation would continue the upward movement with increased percentage of children transported, vehicles used, and the total cost of the transportation program.

The concepts derived from the literature provided the basis for analyzing North Carolina's transportation program. The analysis of current state transportation programs provided alternative funding models which could be considered for use in North Carolina.

Chapter 3

DESIGN AND METHODOLOGY

The purpose of this study was to determine the practices that relate most to increasing or decreasing or maintaining school district's efficiency in the operation of the pupil transportation system. This study was undertaken to: (a) examine variations in pupil transportation costs among North Carolina's 100 school districts that provide transportation, (b) to identify and examine factors related to variations in per pupil transportation costs, and (c) compare North Carolina's approved expenditure transportation funding model with a cost effective density funding model.

The research design is a replication of the Burnett (1981) study design and was implemented in four phases:

1. Information was collected from all states regarding pupil transportation in order to review the current funding plans and features of state pupil transportation programs.

2. Literature related to pupil transportation was reviewed to identify factors that contribute to variations in the cost of pupil transportation, to identify fiscal models used in funding pupil transportation, and to identify criteria for evaluating pupil transportation programs. The literature also was reviewed to search for methods of funding pupil transportation that would promote cost efficient management practices.

The review of literature indicated the following factors were most commonly used in recent pupil transportation research: (a) the number of approved bus route miles per district, (b) the number of pupils approved for transportation, (c) the square mileage of the district, and (d) the district enrollment.

3. Detailed pupil transportation data for 1990-91 were collected from all school districts in North Carolina and analyzed. A set of calculations and statistical analyses was conducted to determine which factors contribute to significant variations in pupil transportation cost among North Carolina's school districts. From the statewide pupil transportation data, the dependent/criterion and independent variables were selected for analysis. The best predicator(s) of cost was determined by using appropriate statistical analysis, such as Pearson product-moment correlation, stepwise multiple regression, multiple regression, scattergrams, linear and quadratic equations) to examine the relationship between the selected dependent/criterion variable and various independent variables that contribute to variations in cost. The best predictor(s) of cost was used in an alternative funding formula(s).

4. Computer simulation was used to analyze the fiscal implications of the alternate plan(s) on the school districts and the state.

POPULATION

The state of North Carolina has 134 school districts, established one per-county for 100 counties plus 34 specially chartered city units.

The subjects used in this study were the 100 public school districts in the state of North Carolina that provide transportation for their students. Displayed in Table 8 are the counties that provide pupil transportation for the city school districts. The three federal schools: Cherokee Central System, Camp LeJeune, and Fort Bragg were not included in this study.

DATA COLLECTED

The following data for the 1990-91 fiscal year were collected from the Division of School Services/Transportation Services of the North Carolina Department of Education. The data were grouped into three categories: allocation information, expenditure information, and geographical/population data related to factors affecting pupil transportation costs.

Allocation Data

1. The ADT of transported pupils for each school district.
2. The total number of school buses in operation for each school district.
3. The total number of miles pupils were transported on

regular routes of each school district.

4. The total number of days buses were operated for each school district.

5. The amount allocated by the state per mile, per bus, and for each pupil transported.

6. The total reimbursement of pupil transportation for each school district.

7. The percent of each school district's pupil transportation operation cost received from state funds.

8. Each school district's rank based on the percentage of operation cost received from the state.

Expenditure Data

1. The total pupil transportation operating cost for each school district.

2. The total cost of pupil transportation (including bus replacement cost and capital outlay) for each school district.

3. The average cost per mile for pupil transportation per pupil per year for each school district.

4. The average cost per mile for each school district.

Geographic/Population Data

1. The ADA of pupils for each school district.

2. The percentage of students transported for each school district.

3. The average miles traveled per bus per day for each school district.

4. The average number of pupils per bus for each school district.

5. The linear density of transported pupils for each school district.

6. The area density of transported pupils for each school district.

Information regarding state pupil transportation programs, including funding formulas, was collected from all states.

STATISTICAL PROCEDURES

Simple and multiple regression procedures were used in the analysis of data in this study. The Statistical Analysis System was utilized since a computer system integrates individual computer programs and allows for greater ease in handling raw data values.

Correlation coefficients indicate the direction and strength of two variables. Correlation coefficient can range from a perfect positive correlation to a perfect negative correlation. The SAS Introductory Guide (Barr, 1976) defines correlation as follows:

> Positive correlation. When two variables are positively correlated, observations that have high values of one variable also tend to have high values of the other.
>
> Negative correlation. When two variables are negatively correlated, high values of one variable tend to be associated with low values of the other variable.
>
> No correlation. When two variables are not correlated, there is no apparent relationship between the values of one and the values of the other.

Correlation coefficients range from -1 to 1. "A correlation coefficient close to 1 means that the two variables are positively correlated; a correlation coefficient near zero means there is little correlation between the values of the two variables; and a correlation coefficient close to -1 means that the variables are negatively correlated."(Barr, 1976).

Multiple regression analysis is utilized when the researcher wants to know the relationship between a dependent or criterion variable and a set of independent or predictor variables. If a single independent variable fails to account for most of the variance, it can be hypothesized that the dependent variable depends on the combined effects of two or more independent variables.

Model statements are developed to test the relationship of a dependent or criterion variable and a set of independent or predictor variables.

The relation between the dependent variable and the independent variables is described in terms of several stepwise procedure outputs Sources of variation include the following:

1. REGRESSION - the variation in the dependent variable which may be attributed to the independent variable or variables in the model statement.

2. ERROR - the variation not accounted for by an independent variable or variables.

3. TOTAL VARIATION - the combined effect of regression and error.

Additional output statistics from the stepwise procedure include degree of freedom; sum of squares; mean squares; F-value (the ratio of the REGRESSION mean square to the ERROR mean square); PROB F (the significance probability of that F-value); and R-Square (the square of the multiple correlation coefficient) (Barr, 1976).

TREATMENT OF DATA

Data for this study were treated according to the following procedures:

1. The researcher reviewed the pupil transportation information received from the states; identified and categorized the funding models used; summarized the factors used to determine local entitlement; identified the distance eligibility used by the various states (state aid is only available for pupils who live beyond prescribed walking distances from school); and noted other pertinent state program characteristics. A table was used in Chapter 4 to display a summary of each state's program characteristics.

2. The researcher reviewed pupil transportation literature to identify sources which provided criteria for evaluating pupil transportation programs. A table was developed in Chapter 2 to display the various criteria identified in the literature. A criterion that was recommended by five or more sources was considered valid for use in evaluating pupil transportation programs.

3. The pupil transportation data collected from the school districts were displayed in two tables for comparison and analysis. From these data, the dependent/criterion variable and the independent variables were selected and analyzed. The following procedures were used in the analysis:

a. The intercorrelations were computed among the variables by using Pearson Product-Moment correlation coefficient.

b. Stepwise multiple regression analysis and multiple regression using Statistical Analysis System (SAS) programs were conducted to analyze the statistical relationship (strength of the relationship) between the dependent/criterion variable and the independent variables to determine the best predictor(s) of cost.

The following series of regressions were conducted:

(1) Stepwise multiple regression of all independent variables with data of all variables in the original form (untransformed) was conducted.

(2) Residuals were obtained on selected combinations of the best predictor variables from step one. Data of all variables were in the original form (untransformed).

(3) Stepwise multiple regressions were conducted with selected independent variables omitted from the analysis. Data of all variables were in the original form (untransformed).

(4) Residuals were obtained on selected combinations of the best predictor variables from step three. Data of all variables were in the original form (untransformed).

(5) The same sequence of regressions (steps 1 through 4) was conducted but with all variable data transformed into common logarithm form.

(6) A simple linear regression was conducted on the best predictor which was linear density.

(7) Stepwise multiple regression was conducted on the two independent variables used in the North Carolina distribution formula. Data of all variables were in the original form (untransformed).

c. Scattergrams of the independent variables versus the dependent variable were plotted to check the forms of the relationship. The Y coordinate was used for the dependent/criterion variable, and the X coordinate was used for the independent variables.

d. Using the best predictor of cost equation(s), the predicted cost was computed for each school district, compared with the actual cost, and the resulting residual listed to show the fiscal implications of each equation on all school districts used in the analysis.

SUMMARY

The procedures described in this chapter were used to compare the pupil transportation costs in North Carolina school districts and predict the probable outcomes that would result from the adoption of a cost efficient pupil transportation funding model. The study of Burnett (1981) was replicated to determine if his findings can be generalized with respect to the total North Carolina school districts.

Chapter 4

RESULTS OF THE STUDY
SELECTION OF EVALUATIVE CRITERIA

From the review of the literature, ten sources (listed in Table 6) were identified which provided specific criteria for judging the quality of pupil transportation programs. Among the sources were recognized authorities in the field of pupil transportation funding, the New Mexico State Department of Education, the National Educational Finance Project, and the Educational Finance and Management Institute.

Table 6 summarizes the various criteria recommended for the evaluation of state pupil transportation programs. Eleven criteria were identified: adequacy, reliability, equity, simplicity, efficiency, objectivity, flexibility, program expansion, stimulation of state standards, utilization of expenditure data, and utilization of past experience.

A criterion that was recommended by five or more sources was considered valid for use in this study. There were six terms that met this criterion: adequacy, reliability, simplicity, efficiency, objectivity, and equity.

Adequacy was the first criterion used in the evaluation process. In terms of adequacy, the state plan should provide sufficient state funds to enable the local unit, with reasonable local effort, to operate a safe, economically efficient, sound, and practical system of transportation for all pupil who should be transported (Johns, 1971). Local districts are not forced to divert funds from needed instructional programs to support an unreasonable share of the cost of pupil transportation if there is adequate state funding. An adequate state program should also include provisions for funding capital outlay.

Reliability was the second criterion used in the evaluation. In terms of reliability, the state plan should not permit the manipulation or control of the distribution factors at the local level.

Stollar contends that when factors such as the number of buses, number of miles, and the number of transported pupils are used, the state must exercise sufficient control through supervision and auditing to prevent abuse (Johns, 1971). Also a study of pupil transportation in Illinois recognized a high correlation between independent variables and the cost per bus route mile; however, the use of cost per bus route mile in the Illinois formula was terminated, because they did not want a manipulable factor in the formula.

Table 6

Selection of Criteria for Evaluating State Pupil Transportation Programs

Sources	Criteria										
	Adequacy	Reliability	Equity	Simplicity	Efficiency	Objectivity	Flexibility	Provide for Program Expansion	Stimulate State Standards	Utilize Expenditure Data	Utilize Past Experiences
1	2	3	4	5	6	7	8	9	10	11	12
D. H. Stollar and K.C. Tanner (Indiana Study)		x	x	x	x	x					
R. L. Johns (Tennessee Study)	x		x	x			x				
New Mexico State Department of Education	x	x	x			x	x	x	x		
C. K. Bernd (Colorado Study)		x	x		x	x					
G. C. Farley and M. D. Alexander (Kentucky Study)		x	x	x	x	x					
L. M. Casey	x				x				x		
K. F. Jordan and C.E. Hanes		x	x	x	x	x				x	
K. Alexander and others (West Virginia Study)	x		x	x	x	x					
E. G. Featherson and D.P. Culp		x	x	x	x	x					x
K. Alexander and J. Hale (Arkansas Study)	x		x	x	x	x					
TOTALS	5	6	9	7	8	8	2	1	2	1	1

Source: Writer's review of pupil transportation literature. See Chapter 2 for complete reference to all sources.

Note: Any criterion used five or more times was considered valid for use in this study.

Simplicity was the third criterion used in the evaluation. The state plan should be as simple as possible, yet maintain accuracy (Alexander, 1977). With a simple formula, calculations are easily made, record keeping is reduced, and a clerical staff may be held to a minimum.

Efficiency was the fourth criterion to be considered. The state plan should discourage extravagant expenditures and promote efficiency of operation on the part of the local school district by providing a direct monetary incentive for efficiency in the local programs (Alexander, 1977). The state should also promote efficiency by establishing state purchasing contracts for buses, parts, and supplies. The state can aid local districts by disseminating information on efficient practices through inservice for transportation personnel.

Efficiency in local transportation programs may be promoted by utilizing some aspect of state average cost in the state plan (Featherson and Culp, 1965). When funding is based on adjusted state average costs, districts with expenditures above the average are reimbursed for a lower proportion of costs than districts with below-average expenditures (Alexander, 1977). The same concept applies when the state uses an equalization formula to predict costs.

Objectivity was the fifth evaluative criterion to be considered. The state plan should be as objective as possible and decisions at the local and state levels should be within broad policy guidelines, thereby avoiding decisions which reflect the values of the individual (Stollar, 1971). An objective state plan should allocate funds according to a predetermined formula which leaves no discretionary power in the hands of state officials (Bernd,1975).

Equity was the final criterion used in the evaluation. To be equitable, the state plan must take into account the factors beyond the control of local school districts which cause a substantial variation in the justifiable cost of the service (Stollar, 1971). The density of transported pupils, road conditions and local wage levels are examples of such factors. Studies in West Virginia, Illinois, Tennessee, Florida, Arkansas, and Virginia concluded that among the equity factors identified, linear density was the principal noncontrollable factor causing variations in pupil transportation costs (Burnett, 1981).

ANALYSIS OF FACTORS RELATED TO COST

North Carolina has 134 school districts, established one per county for 100 counties plus 34 specially chartered city units. The 100 counties provide transportation for the 34 cities.

Data were gathered from the 100 school districts that provided pupil transportation during 1990-91, in order to analyze the various factors that might influence the cost of pupil transportation. Two tables were developed to depict the data.

Table 7 contains the following comparative data for each school district:

1. Average daily attendance of transported pupils;
2. Average daily transported as a percent of the district's total average daily attendance;
3. Total number of buses in daily use;
4. Average number of pupils per bus;
5. Total miles pupils were transported on regular routes;
6. Average miles per bus per day;
7. Number of pupil transportation employees; and
8. Linear density

The data in Table 7 revealed an extremely wide range in the size of pupil transportation programs in North Carolina. Tyrell County had the smallest program: 447 pupils transported, 14 buses, and 113,143 annual miles per year. In contrast, Mecklenburg County, which includes the city of Charlotte, had 49,375 pupils transported, 716 buses, and 8,499,968 annual miles per year. However, most districts transported a high percentage of their pupils.

Seventy-four districts transported more than 60 percent of their pupils; and in two of these districts, Madison and

Washington transported over 90 percent of their pupils.

Hyde County and Camden County had the highest linear density, .98 and .95 respectively, with Catawba County having the lowest linear density at .31. Mecklenburg averaged the highest number of pupils per bus at 69, while Camden County had the lowest number at 29.1 pupils per bus.

Randolph County utilized the highest average miles per bus per day (67.6) with Clay County having the lowest average miles per bus per day (40.8).

Table 8 reports the state's transportation allocations in relation to district expenditures. The following data were compiled for each school district:

1. Average cost per pupil per year;
2. Average cost per mile;
3. Total cost of operation;
4. Amount allocated to the district by the state;
5. Percent of operating cost received from state funds;
6. District's ranking in relation to number five.

A variation in program cost is evidenced in Table 8. Hyde County had the highest average cost per pupil per year ($371); however, the district operated only 16 buses. Harnett County which operated 167 buses had the lowest cost per pupil per year ($144). Bertie County had the lowest cost per mile ($.75), while Guilford County had the highest at $1.94 per mile.

Mecklenburg County, at $11,891,335.00, had the highest operating cost in the state and received the largest allocation from the state ($10,343,960.00); however, the state allocation was only 87.0 percent of their total operating cost, which ranked them 91st in the state. Alleghany County was ranked first in the state in the percent of operating cost received from state funds (100 percent) with Carteret, Cherokee, Clay, Hoke, and Hyde counties ranked second through fifth receiving 100 percent from state funds. Durham County received only 81.5 percent and was ranked last.

Bertie County operated a pupil transportation program with an average mile cost of $.75 and an average per pupil cost of $215. Whereas, Guilford County's program cost $1.94 per mile and $326 per pupil.

Table 7
Comparative Pupil Transportation Data By District For 1990-91

District	ADA of Transported Pupils	ADT as a Percent of ADA	Total Number of Buses	Average Number of Pupils Per Bus	Total Miles Pupils Transported Regular Routes	Average Miles Per Bus Per Day	Number of Pupil Transportation and Service Personnel (Equated Full-Time	Linear Density
	1	2	3	4	5	6	7	8
Alamance County	7,995	0.49	168	47.6	1,437,377	47.5	14.0	.50
Burlington City								
Alexander	3,137	0.67	61	51.4	627,515	57.2	5.50	.56
Alleghany	884	0.60	30	29.5	275,230	51.0	3.00	.86
Anson	3,848	0.87	83	46.4	886,291	59.3	7.00	.64
Ashe	2,354	0.69	73	32.2	758,809	57.7	6.50	.90
Avery	1,595	0.66	43	37.1	409,914	53.0	4.50	.71
Beaufort	4,204	0.56	100	42.0	973,954	54.1	9.00	.64
Washington City								
Bertie	3,261	0.85	90	36.2	936,474	57.8	7.50	.80
Bladen	3,733	0.70	110	33.9	1,148,519	58.0	10.00	.85
Brunswick	6,362	0.76	131	48.6	1,303,506	55.3	11.00	.57
Buncombe	16,888	0.66	297	56.9	2,391,870	44.7	25.00	.39
Asheville City								
Burke	7,185	0.61	99	72.6	991,386	55.6	9.50	.38
Cabarrus	9,662	0.57	152	63.6	1,424,682	52.1	12.50	.41
Kannapolis City								
Caldwell	5,913	0.54	128	46.2	1,021,385	44.3	10.50	.48
Camden	728	0.67	25	29.1	248,627	55.3	2.50	.95
Carteret	4,164	0.54	77	54.1	667,390	48.2	6.50	.45
Caswell	2,484	0.75	78	31.8	808,086	57.6	8.00	.90
Catawba	11,489	0.60	194	59.2	1,491,063	42.7	16.50	.31
Hickory City								
Newton-Conover								
Chatham	3,438	0.61	94	36.6	1,004,539	59.4	9.00	.81
Cherokee	1,736	0.52	46	37.7	411,244	49.7	4.50	.66
Chowan	1,627	0.64	41	39.7	337,339	45.7	3.50	.58
Clay	932	0.81	19	49.1	139,641	40.8	2.50	.42
Cleveland	8,787	0.60	170	51.7	1,397,867	45.7	16.50	.44
Kings Mtn. City								
Shelby City								
Columbus	6,543	0.64	176	37.2	1,361,719	43.0	14.50	.58
Whiteville City								
Craven	8,859	0.63	157	56.4	1,594,882	56.4	13.00	.50
Cumberland	26,640	0.61	422	63.1	3,391,937	44.7	36.50	.35
Currituk	1,965	0.78	38	51.7	357,900	52.3	3.50	.51
Dare	1,678	0.50	36	46.6	364,969	56.3	3.50	.60

Table 7 Continued

District	ADA of Transported Pupils	ADT as a Percent of ADA	Total Number of Buses	Average Number of Pupils Per Bus	Total Miles Pupils Transported Regular Routes	Average Miles Per Bus Per Day	Number of Pupil Transportation and Service Personnel (Equated Full-Time	Linear Density
	1	2	3	4	5	6	7	8
Davidson	13,050	0.63	221	59.0	2,006,377	50.4	19.50	.43
Lexington City								
Thomasville City								
Davie	2,871	0.64	62	46.3	569,431	51.0	5.00	.55
Duplin	5,307	0.70	136	39.0	1,273,943	52.0	11.50	.67
Durham	15,112	0.59	278	54.4	2,293,917	45.8	23.50	.42
Edgecombe	5,198	0.66	122	42.6	1,068,066	48.6	10.50	.57
Tarboro City								
Forsyth	23,284	0.65	364	64.0	4,107,305	62.7	37.00	.49
Franklin	4,070	0.70	106	38.4	1,073,509	56.3	9.00	.73
Franklin City								
Gaston	12,364	0.43	189	65.4	1,459,871	42.9	17.00	.33
Gates	1,362	0.84	34	40.1	338,849	55.4	3.50	.69
Graham	951	0.78	23	41.3	169,829	41.0	2.50	.50
Granville	3,622	0.57	100	36.2	938,570	52.1	8.50	.72
Greene	1,905	0.73	61	31.2	588,393	53.6	6.50	.86
Guilford	35,031	0.69	585	59.9	5,898,765	56.0	52.50	.47
Greensboro City								
High Point City								
Halifax	6,928	0.69	154	45.0	1,439,308	51.9	13.00	.58
Roanoke Rapids								
Weldon City								
Harnett	8,873	0.77	167	53.1	1,274,403	42.4	14.50	.40
Haywood	3,784	0.55	84	45.2	743,464	49.2	7.50	.54
Henderson	4,774	0.58	95	50.3	778,758	45.5	8.00	.45
Hendersonville								
Hertford	3,346	0.81	73	45.8	628,415	47.8	6.50	.52
Hoke	3,774	0.78	69	54.7	568,122	45.7	5.50	.42
Hyde	508	0.62	16	3.18	179,267	62.2	2.50	.98
Iredell	8,680	0.56	144	60.3	1,322,321	51.4	12.50	.43
Mooresville City								
Jackson	2,032	0.60	51	39.8	449,237	48.9	4.50	.61
Johnston	8,784	0.61	217	40.5	1,841,283	47.1	19.00	.58
Jones	1,265	0.84	34	37.2	381,583	62.4	3.50	.84
Lee	5,036	0.67	89	56.6	676,564	42.2	7.50	.37

Source: North Carolina Department of Education

Table 7 Continued

District	ADA of Transported Pupils	ADT as a Percent of ADA	Total Number of Buses	Average Number of Pupils Per Bus	Total Miles Pupils Transported Regular Routes	Average Miles Per Bus Per Day	Number of Pupil Transportation and Service Personnel (Equated Full-Time	Linear Density
	1	2	3	4	5	6	7	8
Lenoir	6,567	0.63	146	45.0	1,244,828	47.4	13.00	.53
Lincoln	4,943	0.59	104	47.5	970,575	51.8	9.00	.55
Macon	2,127	0.64	50	42.5	373,547	41.5	4.50	.49
Madison	2,290	0.94	59	38.8	630,604	59.4	5.50	.76
Martin	2,873	0.60	75	38.3	625,246	46.3	6.50	.60
McDowell	3,573	0.61	81	44.1	823,432	56.5	7.00	.64
Mecklenburg	49,375	0.67	716	69.0	8,499,968	66.0	61.00	.48
Mitchell	1,678	0.74	48	35.0	384,885	44.5	4.50	.64
Montgomery	2,774	0.69	60	46.2	556,936	51.6	5.00	.56
Moore	5,444	0.60	130	41.9	1,134,279	48.5	11.00	.58
Nash	10,272	0.63	177	58.0	1,627,411	51.1	15.00	.44
New Hanover	10,989	0.59	154	70.8	1,570,494	56.7	13.00	.40
Northampton	2,994	0.82	88	34.0	791,916	50.0	7.50	.73
Onslow	12,686	0.70	213	59.6	1,962,689	51.2	17.00	.43
Orange	6,334	0.58	125	50.7	1,286,938	57.2	10.50	.56
Chapel Hill-Carrboro City								
Pamlico	1,338	0.66	36	37.2	319,842	49.4	3.50	.66
Pasquotank	2,847	0.51	52	54.8	467,272	49.9	4.50	.46
Pender	3,214	0.67	76	42.3	770,573	56.3	7.00	.67
Perquimans	1,258	0.69	32	39.3	350,943	60.9	3.50	.77
Person	3,500	0.70	77	45.5	621,953	44.9	7.00	.49
Pitt	10,468	0.61	207	50.6	1,893,432	50.8	18.00	.50
Polk	1,170	0.59	34	34.4	320,524	42.4	3.00	.76
Randolph	9,530	0.57	173	55.1	2,104,060	67.6	16.00	.61
Asheboro City								
Richmond	5,245	0.66	92	57.0	964,956	58.3	8.00	.51
Robeson	15,534	0.72	287	54.1	2,799,972	54.2	24.00	.50
Rockingham	8,154	0.60	171	47.7	1,594,996	51.8	15.00	.54
Eden City								
Reidsville City								
Western Rockingham								
Rowan	10,473	0.65	187	56.0	1,907,799	56.7	15.00	.51
Rutherford	5,746	0.61	111	51.8	924,683	46.3	9.50	.45
Sampson	6,048	0.68	158	38.3	1,500,052	52.7	13.50	.69
Clinton City								

Source: North Carolina Department of Education

Table 7 Continued

District	ADA of Transported Pupils	ADT as a Percent of ADA	Total Number of Buses	Average Number of Pupils Per Bus	Total Miles Pupils Transported Regular Routes	Average Miles Per Bus Per Day	Number of Pupil Transportation and Service Personnel (Equated Full-Time	Linear Density
	1	2	3	4	5	6	7	8
Scotland	6,133	0.88	90	68.1	977,145	60.3	8.00	.44
Stanly	4,541	0.53	103	44.1	834,144	45.0	8.50	.51
Albemarle City								
Stokes	3,826	0.62	107	35.8	1,056,479	54.9	9.00	.77
Surry	5,797	0.58	142	40.8	1,266,415	49.5	13.00	.61
Elkin City								
Mt. Airy City								
Swain	1,197	0.80	30	39.9	272,088	50.4	3.00	.63
Transylvania	1,756	0.46	34	47.5	319,947	48.0	3.50	.51
Tyrrell 477	447	0.64	14	31.9	113,143	44.9	2.50	.70
Union	9,959	0.64	183	54.4	2,212,886	67.2	16.50	.62
Monroe City								
Vance	4,810	0.71	86	55.9	740,110	47.8	7.00	.43
Wake	37,346	0.58	651	57.4	9,301,933	79.4	61.00	.69
Warren	2,443	0.84	69	35.4	735,667	59.2	6.50	.84
Washington	2,480	0.92	50	49.6	411,810	45.8	4.50	.46
Watauga	2,687	0.60	71	37.8	613,597	48.0	6.50	.63
Wayne	11,398	0.65	221	51.6	1,817,795	45.7	18.00	.44
Wilkes	6,487	0.68	125	51.9	1,268,806	56.4	12.00	.54
Wilson	7,186	0.64	162	44.4	1,450,119	49.7	14.50	.56
Yadkin	2,849	0.61	73	39.0	614,831	46.8	6.00	.60
Yancey	1,714	0.74	49	35.0	442,343	50.2	4.50	.72

Source: North Carolina Department of Education

Table 8

Analysis of 1990-91 State Allocations in Relation to District Expenditures

District	Average Cost Per Pupil Per Year	Average Cost Per Mile	Total Cost of Operation (Less Gas Tax Refund)	State Allocation	Percent of Opearting Cost Received From State Funds	State Ranking (In Relation to Column 5)
	1	2	3	4	5	6
Alamance County	211	1.17	1,683,895	1,526,415	90.6%	80
Burlington City						
Alexander	191	0.95	597,867	595,535	99.6%	11
Alleghany	319	1.02	281,926	281,926	100.6%	1
Anson	212	0.92	816,539	810,270	99.2%	13
Ashe	332	1.03	782,531	744,538	95.1%	53
Avery	329	1.28	525,470	484,460	92.2%	76
Beaufort	229	0.99	964,478	931,476	96.6%	40
Washington City						
Bertie	215	0.75	701,547	697,417	99.4%	12
Bladen	252	0.82	939,906	873,717	93.0%	71
Brunswick	222	1.08	1,412,095	1,312,048	92.9%	72
Buncombe	198	1.40	3,342,246	23,961,238	88.6%	86
Asheville City						
Burke	178	1.29	1,276,702	1,187,570	93.0%	70
Cabarrus	158	1.07	1,524,309	11,512,180	99.2%	15
Kannapolis City						
Caldwell	204	1.18	1,208,458	1,069,415	88.5%	88
Camden	324	0.95	236,175	204,217	86.5%	92
Carteret	151	0.94	629,224	629,224	100.0%	2
Caswell	301	0.93	747,943	659,808	88.2%	89
Catawba	146	1.12	1,676,915	1,637,509	97.7%	29
Hickory City						
Newton-Conover						
Chatham	281	0.96	964,376	897,062	93.0%	69
Cherokee	292	1.23	507,038	507,038	100.0%	3
Chowan	192	0.93	312,292	303,845	97.3%	32
Clay	205	1.37	190,969	190,969	100.0%	4
Cleveland	196	1.23	1,718,286	1,573,259	91.6%	78
Kings Mtn. City						
Shelby City						
Columbus	207	0.99	1,353,150	1,329,022	98.2%	23
Whiteville City						
Craven	177	0.99	1,571,896	1,476,210	93.9%	60
Cumberland	153	1.20	4,065,626	3,811,136	93.7%	62
Currituk	233	1.28	457,390	412,339	90.2%	82
Dare	277	1.27	464,226	386,761	83.3%	96

Table 8 Continued

District	Average Cost Per Pupil Per Year	Average Cost Per Mile	Total Cost of Operation (Less Gas Tax Refund)	State Allocation	Percent of Opearting Cost Received From State Funds	State Ranking (In Relation to Column 5)
	1	2	3	4	5	6
Davidson	172	1.12	2,238,776	2,073,671	92.6%	74
Lexington City						
Thomasville City						
Davie	229	1.16	658,060	611,348	92.9%	73
Duplin	207	0.86	1,096,851	1,059,547	96.6%	39
Durham	219	1.44	3,309,443	2,696,440	81.5%	100
Edgecombe	178	0.87	923,928	922,080	99.8%	10
Tarboro City						
Forsyth	311	1.76	7,245,846	5,988,762	82.7%	98
Franklin	248	0.94	1,010,465	966,089	95.6%	49
Franklin City						
Gaston	144	1.22	1,783,655	1,751,822	98.2%	24
Gates	241	0.97	328,538	238,198	99.9%	8
Graham	257	1.44	244,051	230,951	94.6%	57
Granville	227	0.88	822,423	788,550	95.9%	45
Greene	300	0.97	571,876	491,591	86.0%	93
Guilford	326	1.94	11,417,734	9,391,041	82.2%	99
Greensboro City						
High Point City						
Halifax	208	1.00	1,442,597	1,352,971	93.8%	61
Roanoke Rapids						
Weldon City						
Harnett	144	1.00	1,277,179	1,256,089	98.3%	22
Haywood	209	1.07	794,392	763,080	96.1%	43
Henderson	194	1.19	924,973	884,402	95.6%	47
Hendersonville						
Hertford	166	0.89	556,341	550,954	99.0%	17
Hoke	157	1.04	592,249	592,249	100.0%	5
Hyde	371	1.05	188,520	188,520	100.0%	6
Iredell	170	1.11	1,476,218	1,419,519	96.2%	41
Mooresville City						
Jackson	277	1.25	562,236	539,725	96.0%	44
Johnston	200	0.95	1,752,463	1,702,082	97.1%	33
Jones	260	0.86	329,290	315,131	95.7%	46
Lee	164	1.22	826,723	789,336	95.5%	52
Lenoir	194	1.02	1,274,413	1,189,178	93.3%	68

Source: North Carolina Department of Education

Table 8 Continued

District	Average Cost Per Pupil Per Year	Average Cost Per Mile	Total Cost of Operation (Less Gas Tax Refund)	State Allocation	Percent of Opearting Cost Received From State Funds	State Ranking (In Relation to Column 5)
	1	2	3	4	5	6
Lincoln	231	1.18	1,143,558	997,137	87.2%	90
Macon	278	1.58	590,420	555,767	94.1%	49
Madison	266	0.97	610,153	570,389	93.5%	64
Martin	197	0.91	566,023	560,671	99.1%	16
McDowell	222	0.96	793,588	751,055	94.6%	56
Mecklenburg	241	1.40	11,891,335	10,343,960	87.0%	91
Mitchell	296	1.29	497,147	424,157	85.3%	94
Montgomery	202	1.01	560,358	535,500	95.5%	51
Moore	222	1.06	1,206,218	1,135,816	94.2%	58
Nash	175	1.10	1,794,984	1,777,020	99.0%	18
New Hanover	196	1.36	2,140,544	1,958,750	91.5%	79
Northampton	249	0.94	744,511	682,980	91.7%	77
Onslow	163	1.06	2,072,189	1,991,807	96.1%	42
Orange	278	1.37	1,760,684	1,465,749	83.2%	97
Chapel Hill-Carrboro City						
Pamlico	238	1.00	318,435	307,927	96.7%	38
Pasquotank	188	1.15	536,460	501,299	93.4%	66
Pender	242	1.01	778,564	726,703	93.3%	67
Perquimans	307	1.10	386,491	357,019	92.5%	75
Person	191	1.07	667,008	666,009	99.9%	9
Pitt	200	1.11	2,093,612	2,042,777	97.6%	31
Polk	261	0.95	305,309	302,927	99.2%	14
Randolph	214	0.97	2,037,421	1,974,195	96.9%	37
Asheboro City						
Richmond	180	0.98	946,550	926,213	97.9%	28
Robeson	175	0.97	2,713,376	2,681,322	98.8%	19
Rockingham	205	1.05	1,671,037	1,596,990	95.6%	50
Eden City						
Reidsville City						
Western Rockingham						
Rowan	184	1.01	1,925,594	1,867,632	97.0%	36
Rutherford	190	1.18	1,090,156	1,057,543	97.0%	35
Sampson	234	0.94	1,412,754	1,320,547	93.5%	65
Clinton City						
Scotland	148	0.93	908,131	897,395	98.8%	20

Source: North Carolina Department of Education

Table 8 Continued

District	Average Cost Per Pupil Per Year	Average Cost Per Mile	Total Cost of Operation (Less Gas Tax Refund)	State Allocation	Percent of Opearting Cost Received From State Funds	State Ranking (In Relation to Column 5)
	1	2	3	4	5	6
Stanly	197	1.07	892,372	870,915	97.6%	30
Albemarle City						
Stokes	301	1.09	1,151,488	964,341	83.7%	95
Surry	222	1.02	1,288,267	1,231,715	95.6%	48
Elkin City						
Mt. Airy City						
Swain	282	1.24	338,117	305,996	90.5%	81
Transylvania	240	1.32	421,823	412,781	97.9%	27
Tyrrell	325	1.28	145,250	137,954	95.0%	54
Union	207	0.93	2,059,700	2,000,466	97.1%	34
Monroe City						
Vance	149	0.97	718,143	704,831	98.1%	25
Wake	285	1.14	10,650,329	9,573,062	89.9%	83
Warren	275	0.91	670,964	627,247	93.5%	63
Washington	164	0.99	407,876	407,576	99.9%	7
Watauga	282	1.24	758,443	671,487	88.5%	87
Wayne	179	1.12	2,043,566	1,939,656	94.9%	55
Wilkes	201	1.03	1,303,531	1,278,000	98.0%	26
Wilson	191	0.94	1,370,015	1,350,844	98.6%	21
Yadkin	248	1.15	707,821	635,368	89.8%	84
Yancey	293	1.14	502,214	446,785	89.0%	85

Source: North Carolina Department of Education

From the data listed in Table 8, factor one (average cost per pupil per year) was selected for analysis. The seven variables selected for analysis are as follows:

Abbreviation (for use in formulas)	Computer Code	
A	V1	ADA of transported pupils
B	V2	Total number of buses
P	V3	Average number of pupils per bus
M	V4	Total miles pupils were transported.
D	V5	Average miles per bus per day
L	V6	Linear density of transported pupils
C	V7	Average cost per pupil per year

Of the eight most frequently used distribution factors identified in the survey of state programs (Table 4), two are used to analyze North Carolina's pupil transportation costs; number of pupils transported and bus mileage.

Presently, only Maryland, New Mexico, and Texas use road conditions and only Delaware, Georgia, and Michigan use geographic regions as factors in determining local entitlement. Studies have rejected these two factors for use in a distribution formula for two reasons. First, the factors did not add significantly to the cost per transported pupil.

Second, current research recommends simple formulas containing a minimum of factors; and, since road and geographic data are difficult to obtain, the factors are usually omitted from proposed funding formulas.

Expenditures, the most frequently used factor in the survey, are identified as the average cost per pupil per year in the analysis.

The review of literature has indicated other factors that should be considered in addition to the eight variables most frequently used for transportation reimbursement. Studies in Florida, Illinois, Louisiana, Tennessee, Utah, and West Virginia have shown that transportation costs are more realistically related to cost variables other than those presently used by most states. For Tennessee and West Virginia, multiple regression and other analysis, using a broad range of variables, indicated a close relationship between cost and linear density.

Linear density was included in the analysis based on the findings of research studies, even though it is used infrequently in current state reimbursement plans. Area density was not included in the analysis due to the unavailability of data. The average number of pupils per bus, a factor that should be closely associated with population density, was also included in the study.

The average cost per transported pupil was selected as the dependent variable for two reasons. First, current operating expenses provide an accurate analysis of the effects of various factors on daily pupil transportation operations. Second, the average cost per transported pupil provides a good common denominator for an analysis of cost, regardless of the size of the school district.

ANALYSIS OF DATA

The Pearson Product Moment r statistical analysis was used to determine the intercorrelations among the variables. The average cost per pupil per year was used as the dependent variable. The results are displayed in Table 9. A level of .05 was considered significant. Neither V1 nor V4 (pupils transported and miles pupils transported-factors used in North Carolina's reimbursement) were significantly correlated with the dependent variable. V1(pupils transported) correlated with V2, V3, V4, V5, and V6 (number of buses, pupils per bus, annual miles, miles per bus per day, and linear density respectively).

V3, V5, and V6 (pupils per bus, miles per bus per day, and linear density were significantly correlated with the dependent variable V7 (cost per pupil). V3 (pupils per bus) correlated with V6 (linear density) but did not correlate with V5 (miles per bus per day). V5 (miles per bus per day) correlated with V6 (linear density). Linear density V6 had a correlation of .76 verifying its relatively strong relationship with the cost of pupil transportation.

On the basis of the Pearson Product Moment r findings, the linear density was chosen as the best predictor of cost and provided an alternate means of determining the most cost efficient funding model for the state of North Carolina.

The second step in the analysis involved a series of stepwise multiple regressions of the independent variables on the dependent variable to determine the best predictor(s) of cost. The regressions were conducted with the data of the variables in their original form (untransformed) and with the data of the variables transformed into inverse, quadratic and logarithm form.

As indicated in Table 10, by using stepwise multiple regression and all variables (data in original form), the independent variables of V6 (linear density), V1 (number of pupils transported), V2 (number of buses) and V3 (average number of pupils per bus) were ranked first, second, third and fourth, respectively in the analysis. The cumulative R square of these independent variables was .6773, thus accounting for 67.73 percent of the dependent variable. This indicated a strong relationship between this variable combination and the cost of pupil transportation and their use would enable the prediction of 68% of the costs. The remaining variables in the analysis did not meet the .1500 significance level for entry into the model.

In Table 11, by using the variables V6 (linear density), V1 (number of pupils transported), V2 (number of buses) it was possible to generate a coefficient of determination of .63. This indicated a strong relationship between this variable combination and the cost of pupil transportation and their use would enable the prediction of 63 percent of the costs.

In Table 12, by using the variables V6 (linear density) and V1 (number of pupils transported), it was possible to generate a coefficient of .60. This indicated a strong relationship between the cost of pupil transportation and this combination of variables and their use would enable us to predict 60 percent of the costs.

In Table 13, using the variable V6 (linear density) it was possible to generate a coefficient of determination of .5794. This indicated a strong relationship between the cost of pupil transportation and this one variable and its use would enable us to predict 57.94 percent of the costs.The remaining two variables in Table 14, V4 (annual miles) and V5 (miles per bus per day were entered into a stepwise regression. The cumulative R of these variables was 0.1652, thus accounting for 16.52 percent of the dependent variable.

Table 9
Pearson Correlation Coefficients Between Selected Variables

	V1 ADA of Transported Pupils	V2 Total Number of Buses	V3 Average Number of Pupils Per Bus	V4 Total Miles Pupils Transported	V5 Average Miles Per Bus Per Day	V6 Linear Density of Transported Pupils	V7 Average Cost Per Pupil Per Year
V1 ADA of Transported Pupils	1.000	*0.98696	*0.61304	*0.96331	*0.30215	*-0.37563	-0.13385
V2 Total Number of Buses		1.000	*0.54195	0.97194	*0.29701	*-0.32808	-0.12166
V# Average Number of Pupils Per Bus			1.000	*0.48987	0.06734	*-0.82698	*-0.62870
V4 Total Miles Pupils Transported				1.000	*0.44590	*-0.21578	-0.02448
V5 Average Miles Per Bus Per Day					1.000	0.46291	0.35223
V6 Linear Density of Transported Pupils						1.000	*0.76117
V7 Average Cost Per Pupil Per Year							1.000

*0.05, one tailed
**dependent variable (V7)

Table 10

Multiple Regression Analysis of Independent Variables on the Dependent Variable

ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	183808.82311369	4	45952.2057784	49.85
Residual	SSE	87579.33688631	95	921.88775670	
Total Variation		271388.16000000	99		

REGRESSION COEFFICIENTS

Variable	Coefficient	R^2	Increase in R^2	Standard Error
V6 (linear density)	190.00485714	0.5794	0.5794	39.7069
V1 (ADA of transported pupils)	0.01477589	0.6060	0.0266	0.0031
V2 (number of buses)	-0.78334935	0.6301	0.0241	0.1894
V3 (pupils per bus)	-2.80290290	0.6773	0.0471	0.7524

COEFFICIENT OF DETERMINATION R^2 = .6773
Observations: 100
Number of Independent Variables: 4
F significant at .0003

As indicated in Table 10, it was possible to predict 67.73 percent of the cost of pupil transportation using the predictor variables V6, V1, V2, and V3. The coefficient of determination was significant at the .0003 level.

Table 11

Multiple Regression Analysis of Independent Variables on the Dependent Variable

ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	171015.16932971	3	57005.05644324	54.52
Residual	SSE	100372.99067029	96	1045.55198615	
Total Variation		271388.16000000	99		

REGRESSION COEFFICIENTS

Variable	Coefficient	R^2	Increase in R^2	Standard Error
V6 (linear density)	310.10549042	0.5794	0.5794	24.6846
V1 (ADA of transported pupils)	0.00812816	0.6060	0.0266	0.0028
V2 (number of buses)	-0.44231083	0.6301	0.0241	0.1766

COEFFICIENT OF DETERMINATION R^2 = .6301
Observations: 100
Number of Independent Variables: 3
F significant at : .0001

As indicated in Table 11, it was possible to predict 63.01 percent of the cost of pupil transportation using the predictor variables V6, V1, and V2. The coefficient of determination was significant at the .0001 level.

Table 12

Multiple Regression Analysis of Independent Variables on the Dependent Variable

ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	164462.51707471	2	82231.25853736	74.60
Residual	SSE	106925.64292529	97	1102.32621572	
Total Variation		271388.16000000	99		

REGRESSION COEFFICIENTS

Variable	Coefficient	R^2	Increase in R^2	Standard Error
V6 (linear density)	292.85199553	0.5794	0.5794	15.9318
V1 (ADA of transported pupils)	0.00120567	0.6060	0.0266	0.0004

COEFFICIENT OF DETERMINATION R^2 = .6060
Observations: 100
Number of Independent Variables: 2
F significant at: .0001

As indicated in Table 12, it was possible to predict 60.60 percent of the cost of pupil transportation using the predictor variables V6 and V1. The coefficient of determination was significant at the .0001 level.

Table 13

Multiple Regression Analysis of Independent Variables on the Dependent Variable

ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	157235.37131164	1	157235.37131164	134.99
Residual	SSE	114152.78868836	98	1164.82437437	
Total Variation		271388.16000000	99		

REGRESSION COEFFICIENTS

Variable	Coefficient	R^2	Increase in R^2	Standard Error
V6 (linear density)	269.50594033	0.5794	0.5794	23.1965

COEFFICIENT OF DETERMINATION R^2 = .5794
Observations: 100
Number of Independent Variables: 1
F significant at : .0001

As indicated in Table 13, it was possible to predict 57.94 percent of the cost of pupil transportation using the predictor variable V6. The coefficient of determination was significant at the .0001 level.

Table 14

Multiple Regression Analysis of Independent Variables on the Dependent Variable

ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	44834.50524454	2	22417.2526227	9.60
Residual	SSE	226553.65475546	97	2335.60468820	
Total Variation		271388.16000000	99		

REGRESSION COEFFICIENTS

Variable	Coefficient	R^2	Increase in R^2	Standard Error
V5 (miles per bus per day)	3.58218154	0.1241	0.1241	0.8190
V4 (annual miles)	-0.00000854	0.1652	0.0411	0.0000

COEFFICIENT OF DETERMINATION R^2 = .01652
Observations: 100
Number of Independent Variables: 2
F significant at: 0.03

As indicated in Table 14, it was possible to predict 16.52 percent of the cost of per pupil transportation using the predictor variables V4 and V5. The coefficient of determination was significant at the .03 level.

The next step in the analysis was to conduct a stepwise regression on all independent variables but with the data of all variables transformed into logarithm form. The analysis resulted in only V6 (linear density) as being the best predictor of cost.

In Table 15, using the logs of predictor variable V6 (linear density), it was possible to predict 59.86 percent of the cost of pupil transportation. This calculation indicated a high correlation between this variable and the cost of pupil transportation.

Having identified V6 (linear density) as the best predictor of cost, an inverse of data was entered in a stepwise multiple regression. The inverse of V6 (Table 16) resulted in a R2 of .5431, thereby accounting for 54.31 percent of the dependent variance. This calculation indicated a strong relationship between cost of pupil transportation and linear density.

Finally, a stepwise multiple regression with variable data in original form was conducted on the two independent variables used in North Carolina's distribution formula (V1- ADA of transported pupils and V4 - annual miles). In this calculation, no variable met the 0.1500 significance level for entry into this model. In reviewing all of the stepwise multiple regressions, the following summary was compiled to rank the best pair of cost predictors and the best single predictors of cost.

Ranking of two-variable combinations:

V1-V6	Data in quadratic form	R^2	62.19%
V1-V6	Data in inverse form	R^2	62.15%
V1-V6	Data in original form	R^2	60.60%

Ranking of single variables:

V6	Data in logarithm form	R^2	59.86%
V6	Data in original form	R^2	57.93%
V6	Data in quadratic form	R^2	57.93%
V6	Data in inverse form	R^2	54.31%

Scattergrams of the best independent variables versus the dependent variable were plotted to check the forms of the relationships. The relationship between V6 (linear density) and V7 (cost per pupil) were curvilinear (Figure 1). However, the relationship between V1 (ADA of transported pupils) and V2 (number of buses) failed to indicate curvilinearity (Figures 2 and 3).

Table 15

Multiple Regression Analysis of Independent Variables (Data transformed into logarithms)

ANALYSIS OF VARIANCE

Source	Sum of Squares	DF	Mean Square	F	Prob>F
Model	0.058372	1	0.58372	146.164	0.0001
Error	0.039137	98	0.00399		
C Total	0.97510	99			

Root MSE	0.06320	R-square =	0.5986
Dep. Means	2.34227	Adj. R-square =	0.5945
C.V.	2.69802		

PARAMETER ESTIMATES

Variable	DF	Parameter Estimate	Standard Error	T for HO: Parameter=0	Prob>T
V6 (Linear)	1	0.706618	0.05844735	12.090	0.0001

As indicated in Table 15, it was possible to predict 59.86 percent of the cost of pupil transportation using the log of the predictor variable linear density. The coefficient of determination was significant at the .01 level.

Table 16

Multiple Regression Analysis of Independent Variables (Inverse of Data)

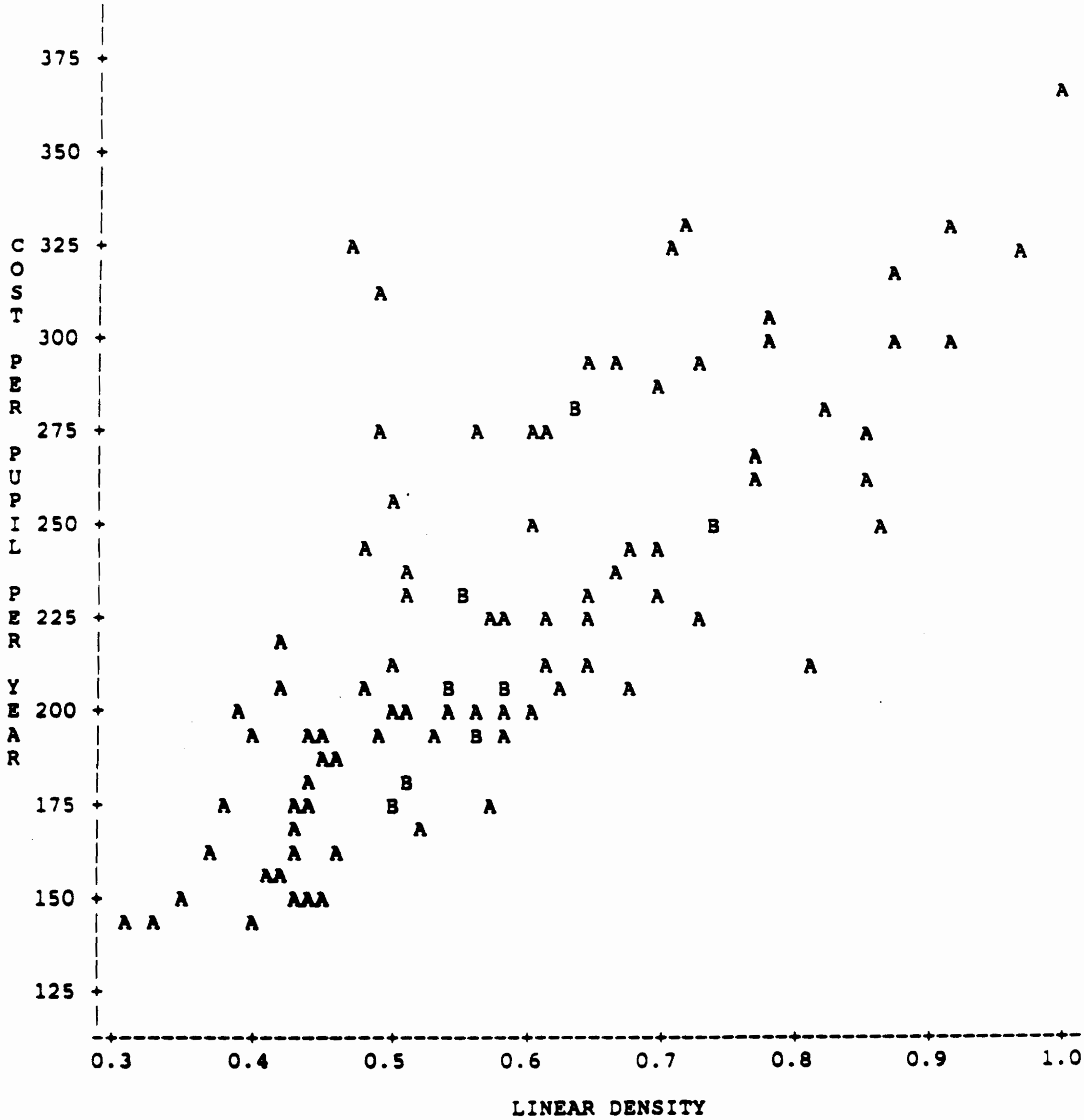
ANALYSIS OF VARIANCE

Source		Sum of Squares	DF	Mean Square	F
Regression	SSR	147397.48845551	1	147397.48845551	116.50
Residual	SSE	123990.67154449	98	1265.21093413	
Total Variation		271388.16000000			

REGRESSION COEFFICIENTS

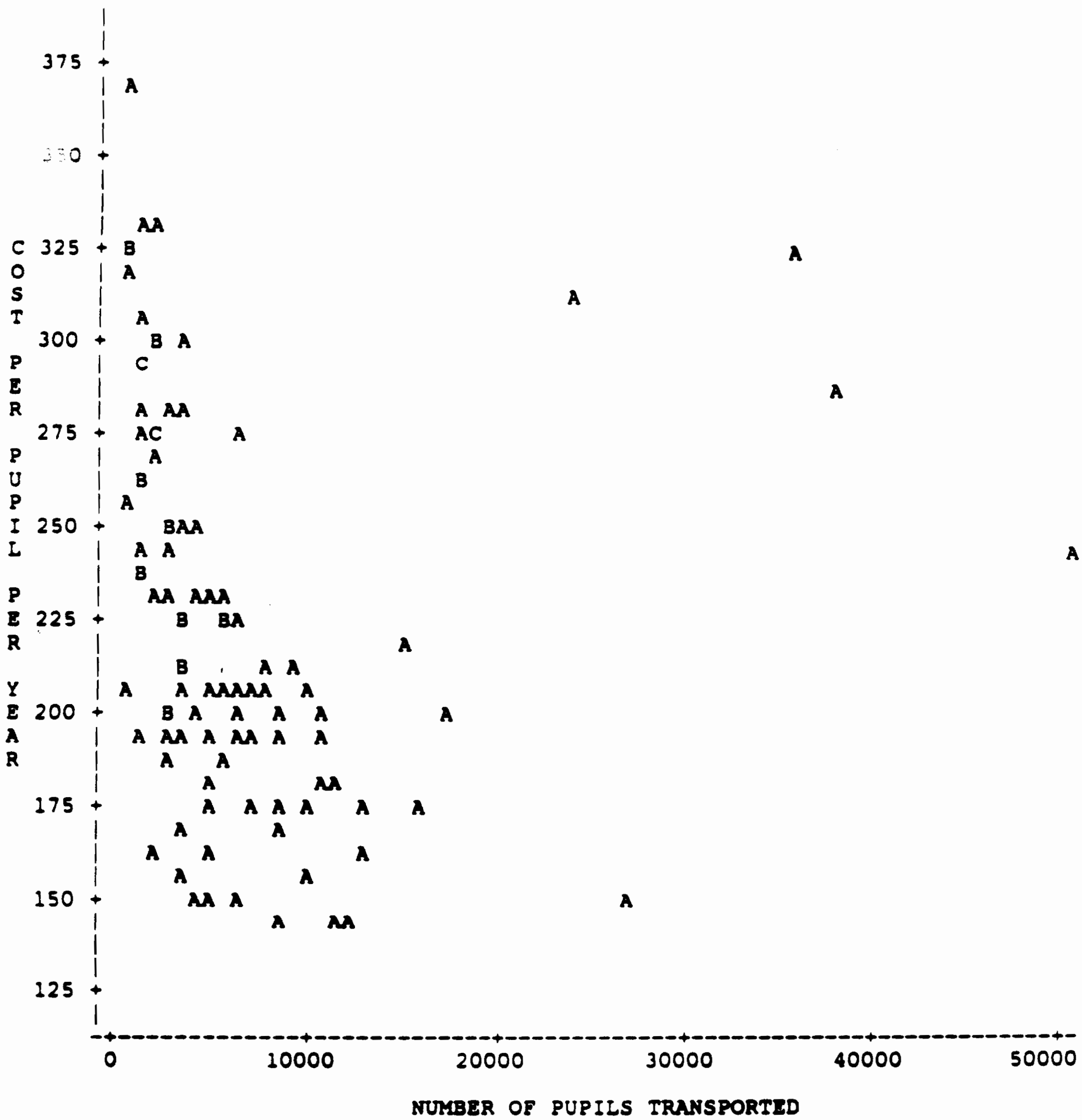
Variable	Coefficient	R^2	Increase in R2	Standard Error
V6 (linear density)	-84.65887800	0.5431	0.5431	14.7923

As indicated in Table 16, it was possible to predict 54.31 percent of the cost of pupil transportation using the inverse of data of the predictor variable V6 (linear density). The coefficient of determination was significant at the 0.001 level.



legend: A=1 observation; B=2 observations

FIGURE 1
RELATIONSHIP BETWEEN LINEAR DENSITY AND THE 1990-91 AVERAGE COST PER PUPIL PER YEAR



legend: A=1 observation; B=2 observations; C=3 observations

FIGURE 2
RELATIONSHIP BETWEEN NUMBER OF PUPILS TRANSPORTED AND THE 1990-91 AVERAGE COST PER PUPIL PER YEAR

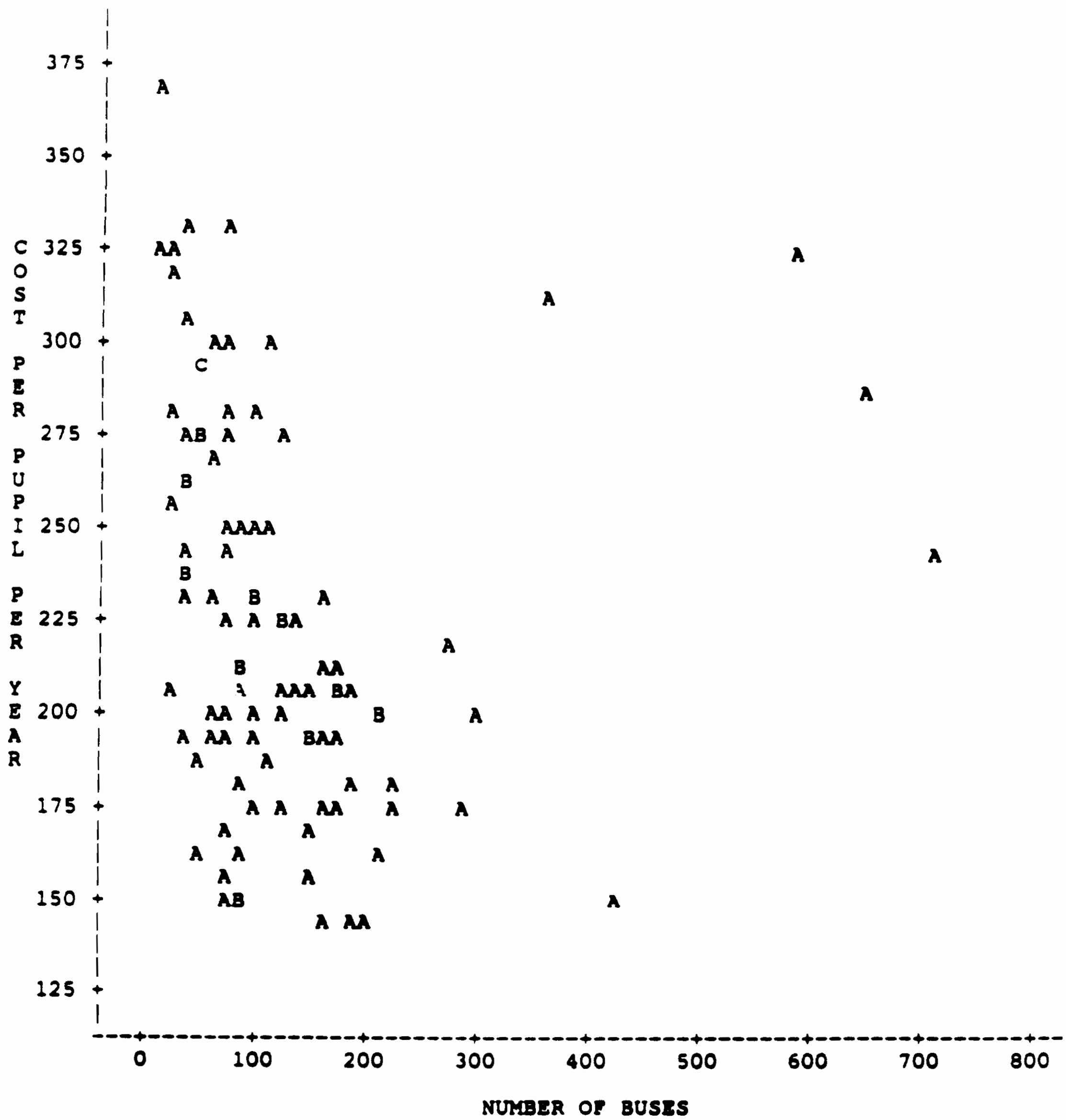


FIGURE 3
RELATIONSHIP BETWEEN NUMBER OF BUSES AND THE
1990-91 AVERAGE COST PER PUPIL PER YEAR

The best cost predictor in an alternate funding formula was linear density. Multiple regression with this variable produced the following equation in Table 17: C = 69.11 + 269.51(L).

The alternate equation C = 69.11 + 269.51(L) was used to predict pupil transportation cost for each school district. The predicted costs were compared with the district's actual cost, and the resulting residuals were noted. Table 18 shows how the equation would impact on the school districts of the state.

Funding under this alternate equation would impact substantially on several school districts. Of the 100 districts involved in this analysis, the predicted costs of 65 districts would be more than their 1990-91 average cost per pupil, and the predicted cost for 35 districts would be less.

Guilford County ($130.22) and Forsyth County ($109.83) represent the greatest variance, in terms of actual cost exceeding predicted cost. Bertie County (-$69.71) and Bladen County (-$46.19) would be the districts most favorably impacted by this alternate formula. There would be three districts (Brunswick, Greene, and Rutherford) with less than one dollar per pupil per year variance between actual and predicted per pupil cost under this alternate formula.

The fiscal impact of this alternate formula on the school districts and the state is displayed in Table 19. Table 19

Table 17

Alternate Equation using best predictor Linear Density

ANALYSIS OF VARIANCE

Source	Sum of Squares	DF	Mean Square	F
Regression SSR	157235.37131	1	157235.37131	134.99
Regression SSE	114152.78869	98	1164.82437	
Total Variation	271388.16000	99		

R2 = .5794

PARAMETER ESTIMATES

Variable	Parameter Estimate	Standard Error	Prob>F
Intercep	69.110098	13.9048	0.0001
Linear	269.505940	23.1966	

ALTERNATE EQUATION

C = Cost per pupil
L = Linear Density

$$C = 69.11 + 269.51 (L)$$

Table 18
Comparison of Predicted Cost Per Pupil Using One Alternate Equation
1990-91

District	Actual Cost Per Pupil	Predicted Cost Alt. 1	Residual Alt. 1
	1	2	3
Alamance County	211	203.86	7.13
Burlington City			
Alexander	191	220.03	-29.03
Alleghany	319	300.88	18.11
Anson	212	241.59	-29.59
Ashe	332	311.66	20.33
Avery	329	260.46	68.53
Beaufort	229	241.59	-12.59
Washington City			
Bertie	215	284.71	-69.71
Bladen	252	298.19	-46.19
Brunswick	222	222.73	-0.73
Buncombe	198	174.21	23.78
Asheville City			
Burke	178	171.52	6.47
Cabarrus	158	179.60	-21.60
Kannapolis City			
Caldwell	204	198.47	5.52
Camden	324	325.14	-1.14
Carteret	151	190.39	-39.38
Caswell	301	311.66	-10.66
Catawba	146	152.65	-6.65
Hickory City			
Newton-Conover			
Chatham	281	287.41	-6.41
Cherokee	292	246.98	45.01
Chowan	192	225.42	-33.42
Clay	205	182.30	22.69
Cleveland	196	187.69	8.30
Kings Mtn. City			
Shelby City			
Columbus	207	225.42	-18.42
Whiteville City			
Craven	177	203.86	-26.86
Cumberland	153	163.43	-10.43
Currituk	233	206.56	26.44
Dare	277	230.81	46.18
Davidson	172	184.99	-12.99
Lexington City			
Thomasville City			
Davie	229	217.34	11.66
Duplin	207	249.68	-42.68
Durham	219	182.30	36.69
Edgecombe	178	222.73	-44.73
Tarboro City			
Forsyth	311	201.17	109.83
Franklin	248	265.85	-17.85
Franklin City			
Gaston	144	158.04	-14.04
Gates	241	255.07	-14.07
Graham	257	203.86	53.13
Granville	227	263.15	-36.15
Greene	300	300.88	-0.88
Guilford	326	195.78	130.22
Greensboro City			
High Point City			

Table 18
(continued)

District	Actual Cost Per Pupil	Predicted Cost Alt. 1	Residual Alt. 1
	1	2	3
Halifax	208	225.42	-17.42
Roanoke Rapids			
Weldon City			
Harnett	144	176.91	-32.91
Haywood	209	214.64	-5.64
Henderson	194	190.39	3.61
Hendersonville			
Hertford	166	209.25	-43.25
Hoke	157	182.30	-25.30
Hyde	371	333.23	37.77
Iredell	170	184.99	-14.99
Mooresville City			
Jackson	277	233.51	43.48
Johnston	200	225.42	-25.42
Jones	260	295.49	-35.49
Lee	164	168.82	-4.82
Lenoir	194	211.95	-17.95
Lincoln	231	217.34	13.66
Macon	278	201.17	76.83
Madison	266	273.93	-7.93
Martin	197	230.81	-33.81
McDowell	222	241.59	-19.59
Mecklenburg	241	198.47	42.52
Mitchell	296	241.59	54.40
Montgomery	202	220.03	-18.03
Moore	222	225.42	-3.42
Nash	175	176.91	-12.69
New Hanover	196	176.91	19.08
Northampton	249	265.85	-16.85
Onslow	163	184.99	-21.99
Orange	278	220.03	57.96
Chapel Hill-Carrboro City			
Pamlico	238	246.98	-8.98
Pasquotank	188	193.08	-5.08
Pender	242	249.68	-7.68
Perquimans	307	276.63	30.36
Person	191	201.17	-10.16
Pitt	200	203.86	-3.86
Polk	261	273.93	-12.93
Randolph	214	233.51	-19.51
Asheboro City			
Richmond	180	206.56	-26.56
Robeson	175	203.86	-28.86
Rockingham	205	214.64	-9.64
Eden City			
Reidsville City			
Western Rockingham			
Rowan	184	206.56	-22.56
Rutherford	190	190.39	-0.38
Sampson	234	255.07	-21.07
Clinton City			
Scotland	148	187.69	-39.69
Stanly	197	206.56	-9.56
Albemarle City			

Table 18
(continued)

District	Actual Cost Per Pupil	Predicted Cost Alt. 1	Residual Alt. 1
	1	2	3
Stokes	301	276.63	24.36
Surry	222	233.51	-11.51
Elkin City			
Mt. Airy City			
Swain	282	238.90	43.09
Transylvania	240	206.56	33.43
Tyrrell	325	257.76	67.23
Union	207	236.20	-29.20
Monroe City			
Vance	149	184.99	-35.99
Wake	285	255.07	29.92
Warren	275	295.49	-20.49
Washington	164	193.08	-29.08
Watauga	282	238.90	43.09
Wayne	179	187.69	-8.69
Wilkes	201	214.64	-13.64
Wilson	191	220-03	-29.03
Yadkin	248	230.81	17.18
Yancey	293	263.15	29.84

Table 19
Analysis of 1990-91 State Allocations in Relation to District Expenditures

District	Total Cost of Operation 1	Total Predicted Cost 2	State Allocation 3
Alamance County	1683895	1629900	1526415
Burlington City			
Alexander	597867	690251	595535
Alleghany	281926	265985	281926
Anson	816539	929662	810270
Ashe	782531	733668	744538
Avery	525470	415437	484460
Beaufort	964478	1015671	931476
Washington City			
Bertie	701547	928465	697417
Bladen	939906	1113156	873717
Brunswick	1412095	1417012	1312048
Buncombe	3342246	2942208	2961238
Asheville City			
Burke	1276702	1232398	1187570
Cabarrus	1524309	1735383	1512180
Kannapolis City			
Caldwell	1208458	1173581	1069415
Camden	236175	236705	204217
Carteret	629224	792781	629244
Caswell	747943	774185	659808
Catawba	1676915	1753888	1637509
Hickory City			
Newton-Conover			
Chatham	964376	988126	897062
Cherokee	507038	428768	507038
Chowan	312292	366767	303845
Clay	190969	169907	190969
Cleveland	1718286	1649270	1573259
Kings Mtn. City			
Shelby City			
Columbus	1353150	1474961	1329022
Whiteville City			
Craven	1571896	1806040	1476210
Cumberland	4965626	4354001	3811136
Currituk	457390	405890	412339
Dare	464226	387309	386761
Davidson	2238776	2414240	2073671
Lexington City			
Thomasville City			
Davie	658060	623984	611348
Duplin	1096851	2754981	2696440
Durham	3309443	2754981	2696440
Edgecombe	923928	1157754	922080
Tarboro City			
Forsyth	7245846	4684039	5988762
Franklin	1010465	1082018	966089
Franklin City			
Gaston	1783655	1954109	1751822
Gates	328538	347407	328198
Graham	244051	193875	230951
Granville	822423	953155	788550
Greene	571876	573192	491591
Guilford	11417734	6858358	9391041
Greensboro City			
High Point City			

Table 19
(continued)

District	Total Cost of Operation	Total Predicted Cost	State Allocation
	1	2	3
Halifax	1442597	1561749	1352971
Roanoke Rapids			
Weldon City			
Harnett	1277179	1569757	1256089
Haywood	794392	814364	763080
Henderson	924973	908919	884402
Hendersonville			
Hertford	556341	700167	550954
Hoke	592249	688016	592249
Hyde	188520	169280	188520
Iredell	1476218	1605793	1419519
Mooresville City			
Jackson	562236	474494	539725
Johnston	1752463	1980140	1702082
Jones	329290	373805	315131
Lee	826723	850221	789336
Lenoir	1274413	1391877	1189178
Lincoln	1143558	1074314	997137
Macon	590420	427888	555767
Madison	610153	627317	570389
Martin	566023	663134	560671
McDowell	793588	863223	751055
Mecklenburg	11891335	9799693	11891335
Mitchell	497147	405398	424157
Montgomery	560358	610378	535500
Moore	1206218	1227218	1135816
Nash	1794984	1927996	1777020
New Hanover	2140544	1928008	1958750
Northampton	744511	795961	682980
Onslow	2072189	2346901	1991807
Orange	1760684	1393705	1465749
Chapel Hill-Carrboro City			
Pamlico	318435	330468	307927
Pasquotank	536460	549711	501299
Pender	778564	802476	726703
Perquimans	386491	348003	357019
Person	667008	704094	666009
Pitt	2093612	2134058	2042777
Polk	305309	320506	302927
Randolph	2037421	2225360	1974195
Asheboro City			
Richmond	946550	1083407	926213
Robeson	2713376	3166838	3681322
Rockingham	1671037	1750218	1596990
Eden City			
Reidsville City			
Western Rockingham			
Rowan	1925594	2163303	1867632
Rutherford	1090156	1093978	1057543
Sampson	1412754	1542674	1320547
Clinton City			
Scotland	980131	1151129	897395
Stanly	892372	937989	870915
Albemarle City			

Table 19
(continued)

District	Total Cost of Operation	Total Predicted Cost	State Allocation
	1	2	3
Stokes	1151488	1058396	964341
Surry	1288267	1353663	1231715
Elkin City			
Mt. Airy City			
Swain	338117	285964	305996
Transylvania	421823	362719	412781
Tyrrell	145250	115221	137954
Union	2059700	2352377	2000466
Monroe City			
Vance	718143	8898836	704831
Wake	10650329	9525915	9573062
Warren	670964	721902	627247
Washington	407876	478849	407576
Watauga	758443	641927	671487
Wayne	2043566	2139340	1939656
Wilkes	1303531	1392404	1278000
Wilson	1370015	1581175	1,370,015
Yadkin	707821	657594	707,821
Yancey	502214	451051	446785
TOTALS	145,095,244	146,234,866	131,432,610

displays each district's total cost of operation, total predicted cost under the alternate formula, and the state's allocation for 1990-91.

COMPARISON OF CURRENT FUNDING MODEL WITH LINEAR DENSITY MODEL

The six principles developed by Featherson and Culp (1965) were chosen to compare the current approved model of funding pupil transportation in the state of North Carolina with the linear density funding model that was the best predictor found in the statistical analysis. These principles are in general use as a standard for current researchers such as Alexander, K. (1977) and Frohreich, L. (1973). These six principles are:

1. The state formula must take into account the factors which can cause a considerable variation in the justifiable cost of the service.

The allocation for North Carolina's funding model is based largely on historical data and trend analysis of prior year maintenance and operating costs and adjusted annually based on fuel costs, personnel salaries, and adjustments in ridership. Expenditures must be for approved items, but there is no limit to cost. The linear density funding model uses the linear density of the districts bus routes as the key factor in determining the funding level. Pearson Product Moment r analysis of linear density (Table 9) indicates that 76.11% of the cost of North Carolina's pupil transportation is determined by linear density.

2. The state plan for measuring the transportation need of the district should be as simple as possible to be fairly accurate.

The current pupil transportation funding model and linear density funding models for measuring the district's transportation needs are simple enough to allow for the state and local districts to accurately budget for transportation costs without involving unduly complex computations.

3. Factors in the state transportation formula should be of such a nature that they cannot be controlled or manipulated by the local district.

The current funding model could be subject to local manipulation. The linear density funding model is based on the average costs of school districts with similar densities and therefore less subject to local manipulation.

4. Allocation of funds in state transportation formulas must be based on past experience.

Both the current funding model and the linear density funding formula is based on the previous year's expenditure level.

5. The plan for measuring pupil transportation need should be as objective as possible.

The present funding model has been found to be objective. The linear density funding model is also objective and is based on the average cost of the previous years pupil transportation at districts with similar densities (Anthony,P. and Inman, D., 1985).

6. The state formula for transportation funding should promote efficiency of operation on the part of the local school district.

The current funding model has little efficiency, while the linear density funding model for pupil transportation reimburses those districts which are most efficient at a higher rate than those districts which are less efficient. Those districts with transportation costs that are above the average cost of districts with similar linear densities will have to pay a higher percentage of the total cost than those with costs at or below the average (Anthony, P. and Inman, D., 1985).

SUMMARY

The first section of this chapter provided an explanation of North Carolina's pupil transportation program. This chapter dealt with the review and selection of evaluative criteria suitable for judging the quality of pupil transportation programs. The criteria selected were adequacy, reliability, simplicity, efficiency, objectivity, and equity. In evaluating North Carolina's present pupil transportation program with these criteria, it was found that North Carolina met the requirements for adequacy, simplicity, and objectivity and partially fulfilled the requirements for efficiency and equity but did not meet the standards for reliability.

This study examined the relationships between the cost of pupil transportation and variables which the literature suggested were important in the determination of the cost pupil transportation. Data were collected from the 100 districts which provided pupil transportation during the 1990-91 school year.

These data were analyzed and the variables to be used in the analysis were selected. Those selected were: ADA of transported pupils, total number of buses, average number of pupils per bus, total miles pupils were transported, average miles per bus per day, linear density of the district, and the average cost per pupil per year. The average cost per pupil per year was selected as the dependent/criterion variable.

The next step in the analysis was to compute the intercorrelation among the variables. Linear density was the most highly correlated of the independent variables with the dependent variable.

A series of stepwise multiple regressions of the independent variables on the dependent variable was conducted to determine the best cost predictor(s). The regressions were conducted with the data of the variables in their original form and with the variable data transformed into inverse, quadratic, and logarithm. Linear density was the best predictor of cost (57.94% in original and quadratic form, 54.31% in inverse form, and 59.86% in logarithm form).

Scattergrams of the independent variables versus the dependent variable were conducted to check the forms of the relationship. Only linear density suggested curvilinearity.

After analyzing the best cost predictor variables, linear density was selected for consideration as an alternate funding formula.

Finally, the fiscal implication of the alternate equation was reviewed for all districts and the alternate formula was used to compute pupil transportation allocations for each school district.

Linear density, the best cost predictor variable was selected for consideration as an alternate funding formula.

Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the summary, conclusions, and recommendations relative to a study of pupil transportation of the State of North Carolina.

The problem of this study was to: (a) examine the variations in pupil transportation costs among North Carolina's 100 school districts which provide pupil transportation, (b) identify and examine factors related to variations in per pupil transportation costs, and (c) compare North Carolina's approved expenditure transportation funding model with a cost effective density funding model.

The first activity was to collect information from all states regarding pupil transportation in order to review their current funding plans.

The second activity was to conduct a review of the literature pertaining to the role of pupil transportation in the American education system and the various means of providing this service. The review of literature and the examination of various state pupil transportation programs provided the foundation and framework needed to analyze North Carolina's pupil transportation program.

The third activity was the gathering of data from the North Carolina State Department of Education regarding the 1990-91 school year. The population of the study was the 100 school districts which provided pupil transportation during the 1990-91 school year.

In the fourth activity, appropriate methodology was developed to answer the questions raised in the study and to facilitate the analysis of selected cost variables. Evaluative criteria were selected and used to evaluate North Carolina's pupil transportation programs. The data gathered from the North Carolina State Department of Education was statistically treated using the Statistical Analysis Software System by Softext Publishing Corporation (1984). An alternative state aid formula for pupil transportation in North Carolina was developed, and the fiscal effects of this formula on North Carolina's school districts was presented.

CONCLUSIONS

The purpose of this study was to examine North Carolina's pupil transportation program and to develop an alternate funding formula suitable for use in the state. Specific questions were presented, and the conclusions of the study are presented to these questions. The following questions were presented:

1. What types of funding plans are used for pupil transportation in other states, and what are the valid, established criteria which may be used to evaluate state pupil transportation programs?

The writer's survey of current state pupil transportation programs revealed a wide variety of approaches in funding pupil transportation.

From the survey information, key characteristics of the various state transportation programs were grouped and summarized. The fiscal models used for allocating funds were grouped into five models: equalization concept/formula, percentage grant, flat grant, approved cost, and state-owned/operated. The equalization concept/formula recognizes variations in transportation costs due to factors beyond the control of the local board and attempts to equalize the distribution of funds by taking one or more of the factors into consideration. The percentage grant model provides for the payment of a fixed percentage of the district's approved transportation costs. The flat grant model provides a fixed monetary value for one or more cost factors. In the approved cost model, the state pays the district's entire approved cost of pupil transportation.

Twenty-one states used some type of equalization plan; sixteen states used a percentage grant; twenty-one states used the flat grant model; seven states used approved cost; and two states own and operate the transportation systems. States frequently used combinations of two or more fiscal models in distributing pupil transportation funds.

Factors used by states to distribute local entitlement were grouped into fourteen categories:

1.	Linear density	(3)
2.	Area density	(8)
3.	Road conditions	(3)
4.	Geographic regions	(3)
5.	Assessed valuation	(10)
6.	Bus replacement	(10)
7.	Number of pupils transported	(25)
8.	Bus depreciation	(7)
9.	Number of buses	(9)
10.	Size of buses	(10)
11.	Bus insurance	(4)
12.	Bus mileage	(20)
13.	Driver salaries/bus hours	(8)
14.	Expenditures	(29)

The frequency of use by these states is noted to the right of each factor.

Statements and terms related to evaluating state pupil transportation programs were identified from the review of literature. The sources included recognized authorities in the field of pupil transportation funding, the New Mexico State Department of Education, the National Educational Finance Project, and the Educational Finance and Management Institute.

A term that was recommended by five or more sources was considered valid for use in this study. The following terms met this criterion:

Adequacy

The state plan should provide sufficient state funds to enable the local unit, with reasonable local effort, to operate a safe, economical, and efficient system of transportation for all pupils who should be transported.

Reliability

The state plan should not permit the manipulation or control of the distribution factors at the local level.

Simplicity

This specific that the state plan should be as simple as possible yet maintain accuracy.

Efficiency

The state plan should discourage extravagant expenditures and promote efficiency of operation on the part of the local school district by providing a direct monetary incentive for efficiency in local programs.

Objectivity

The state plan should be as objective as possible. Decisions at the local and state levels should be within broad policy guidelines, thereby avoiding decisions which reflect the values of the individual. Also, funds should be allocated according to a predetermined formula which leaves no discretionary power in the hands of state officials.

Equity

The state plan must take into account factors beyond the control of local school districts which cause a substantial variation in the justifiable cost of the service.

2. How adequately does the North Carolina pupil transportation program meet valid, established evaluation criteria?

The six evaluative criteria established in this study were used to evaluate North Carolina's pupil transportation program. North Carolina's current allocation plan met the requirements for adequacy, simplicity, objectivity, and partially fulfilled the requirements for efficiency and equity, but did not meet the standards for reliability. (Norfleet Gardner, personal communication, February 11, 1993).

3. What factors cause variations in the necessary cost of pupil transportation among the school districts of North Carolina , and which factor(s) is the best predictor of pupil transportation cost?

There are variations among the school districts of North Carolina in the amount spent for pupil transportation. Total expenditures are usually related to the number of pupils transported, which directly affects the number of buses, number of employees, and other operational costs.

Cost factors were reviewed, including those identified in the survey of state pupil transportation programs. Special consideration was given to those cost factors which are beyond the control of the local school district. The following seven cost factors were selected for analysis:

1. Average daily attendance of transported pupils;
2. Total number of buses;
3. Average number of pupils per bus;
4. Total miles pupils were transported;
5. Average miles per bus per day;
6. Linear density of transported pupils; and
7. Average cost per pupil per year.

In analyzing the cost factors, the average cost per pupil per year was selected as the dependent variable. This dependent variable provides a good common denominator for an analysis of cost, regardless of the size of the school district.

Calculations of the intercorrelations among the variables revealed that the reimbursement factors currently in use in North Carolina (pupils transported and miles pupils transported) were not significantly correlated with the dependent variable. Linear density had the highest correlation with the dependent variable.

A series of stepwise multiple regressions of the independent variables on the dependent variable pointed to several conclusions. When using stepwise regression with all variables, linear density was the best predictor of cost, with the number of pupils transported being second. However, it was noted that a high correlation existed between the average number of pupils per bus and linear density during the analysis of correlations. Therefore, when the average number of pupils per bus is removed from the stepwise regression, linear density became the best predictor of cost. When using logarithmic transformation of data, linear density was the best predictor of cost.

Having identified linear density as the best predictor of cost, an inverse of data was entered in a stepwise multiple regression. This calculation indicted a strong relationship between the cost of pupil transportation and linear density.

The average number of transported pupils, when combined with linear density, explained the highest percent of the variation in pupil transportation costs. The single variable, linear density, provided the highest predictor of cost in logarithmic form, original form, quadratic form, and inverse form.

Of the cost effective pupil transportation funding models, the linear density funding was best suited for the state of North Carolina. The data of this study indicated that linear density was well suited to be used as the primary variable in predicting the cost of pupil transportation.

While linear density was not a perfect predictor of variations in pupil transportation costs, it did explain a large proportion of the variance and would not be expected to account for all cost variations unless all districts were equally efficient and provided an equal quality of service.

The linear density model provided for equitable treatment of school districts with varying socioeconomic and geographic conditions by adjusting for the single most important factor associated with variations in the cost of pupil transportation among districts in North Carolina.

The linear density model presented in this study would enable each school district to provide adequate transportation service to all pupils who need it provided that a sufficient level of state financing was maintained, that safety standards continue to be enforced, and that adequate technical assistance be provided by the Department of Education. If the density/cost efficiency line were recomputed each year, inflation and changes in enrollment patterns would automatically be taken into account.

The linear density model provides a direct monetary incentive for efficiency in local transportation management. Since funding is based on average costs adjusted for linear density, districts whose expenditures area above the average level represented by the linear density/cost efficiency line are reimbursed for a lower proportion of costs than districts whose efficiency is above average. A related advantage is that districts that are well above predicted levels are clearly identified. Using this information the State Department of Education personnel could work closely with these districts to identify possible inefficient practices. Inversely, districts whose costs are well below average should be examined to verify that the level of service being provided is adequate, the quality of their equipment is maintained at a high standard and to identify exemplary practices which may be helpful in lowering costs in other districts.

4. What alternate funding plans can be considered for use in North Carolina, and what are the fiscal implications of such plans on the school districts and the state?

One purpose of this study was to develop an alternate funding formula which may be more suitable than the present North Carolina plan. This formula should meet the evaluation criteria established in this study. Also, the review of literature strongly recommends utilizing cost factors that are beyond the control of the local school district.

Based on the findings of this study, one alternate formula appears to be superior to the present North Carolina reimbursement plan. The analysis of cost factors revealed that the reimbursement factors used by North Carolina (transported pupils and annual miles) did not correlate significantly with per pupil cost. Therefore, if these had been the only variables available as predictor candidates, one would have an equation of low effectiveness.

The best cost predictor in an alternate funding formula was linear density. The equation developed (Table 17) was a better predictor of transportation costs than the present North Carolina plan. This alternate plan represents the average cost/cost efficiency approach to funding pupil transportation. The concept is simple, objective, and promotes efficiency. This alternate plan can provide for the equitable treatment of school districts by adjusting for the important nonmanipulable factor associated with variations in per pupil cost among districts (linear density).

The fiscal implication of this alternate formula on North Carolina's school districts is shown in Table 18. The predicted cost per pupil per year for each school district was computed with the alternate equation and compared with the district's actual cost. Funding under this alternate equation would impact substantially on several school districts. Of the 100 districts involved in this analysis, the predicted costs of 65 districts would be more and the predicted costs for 35 districts would be less.

The alternate formula was used in Table 19 to show the fiscal impact on the school districts and the state. The total predicted cost was slightly more than the total cost of operation. The state allocation would require an additional 11.9 million dollars in state funding.

Although the alternate equation explained a percentage of the variation in per pupil cost, other factors influence transportation costs. A major proportion of the unexplained variance is probably due to efficiency and quality variations among school districts, which should not be considered in a pupil transportation funding formula.

The alternate formula would impact the state only to the extent to which the state wishes to fund pupil transportation. If the state funded the predicted cost computed by the alternate formula, a substantial increase in funds would be required. The average cost/cost efficiency concept under the alternate formula might influence the state to increase pupil transportation funding to a level closer to the average cost of pupil transportation in the state.

RECOMMENDATIONS

Based on the results of this study the writer offers the following recommendations:

1. The state of North Carolina should adopt a cost effective pupil transportation funding model using linear density and the primary determinant of funding.
2. The state should conduct a study that would explore the potential savings that could be generated by school districts cooperating in the delivery of pupil transportation. Hanson, D. G. (1986) performed such

a study in Idaho and Washington that could be used as a background.

3. The state should adopt the alternate equation for the distribution of pupil transportation funds. The alternate formula met all evaluative criteria and explained a high percentage of the cost variance. In addition, the linear density variable used in the formula is currently computed for each school district in the state. However, since linear density is dependent upon mileage, it is recommended that the state include an on-site audit of mileage when the staff conducts the annual school bus inspections. This could be accomplished by checking only two or three routes (random samples) per district.

    The alternate formula would provide for equitable funding by adjusting the most important, nonmanipulative factor associated with variations in per pupil cost (linear density). It would also provide a direct monetary incentive for efficiency in local pupil transportation management. Since funding would be based on average cost adjusted for linear density, districts with expenditures above the average level represented by the linear density curve would be reimbursed for a lower proportion of costs than districts with above average efficiency.

The alternate formula would provide a simple and objective method of allocating pupil transportation funds. While regression analysis is rather complex, standard statistical software programs are readily available to facilitate the computations.

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APPENDICES

APPENDIX A

NORTH CAROLINA TRANSPORTATION LAWS

NORTH CAROLINA SCHOOL LAWS
Title 16
Education

Article 17

Supporting Services

Part 1. Transportation

Section 115C-254	Use of school buses by State Guard or National Guard.
Section 115C-255	Liability insurance and waiver of immunity as to certain acts of bus drivers.
Section 115C-256	School bus drivers under Workers' Compensation Act.
Section 115C-257	Attorney General to pay claims.
Section 115C-258	Provisions regarding payment.
Section 115C-259	Claims must be filed within one year.
Section 115C-260	Repealed by Session Laws, 1981.
Section 115C-261	Repealed by Session Laws, 1981.

APPENDIX B

LETTER REQUESTING PUPIL TRANSPORTATION INFORMATION FROM THE STATES

October 1, 1992

^F1^

Dear ^F2^:

We are currently conducting pupil transportation studies in the states of Virginia and North Carolina. In conjunction with these studies, we would like to solicit your cooperation in obtaining information about your state's transportation program, especially information pertaining to the formula for the distribution of pupil transportation funds.

We would appreciate information for the year 1990-91 such as methods of calculation, law pertaining to transportation, and other information that would be helpful in understanding and comparing your method of financing pupil transportation.

Your cooperation will be greatly appreciated.

Sincerely yours,

M. David Alexander
^F3^

Gloria W. Whitehurst

APPENDIX C

FUNDING CHARACTERISTICS OF STATE PUPIL TRANSPORTATION PROGRAMS CLYDE BURNETT, 1981

Table 4

Funding Characteristics of State Pupil Transportation Programs

State	Fiscal Models (Basis for Allocation)					Factors Used to Determine Local Entitlement															Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Alabama	x						x					x							x		2	2	The counties are grouped into 11 density groups.
Alaska		x		x							x								x		1½	1½	The state reimburses up to 100% of actual operational costs (including special education transportation), 90% of capital expenditures, and 50% of cost of hazardous route transportation.
Arizona			x														x				1	1½	Transportation aid is based on computations involving .27 per daily route mileage and total bus mileage.
Arkansas	x						x			x		x		x	x					[a]x	2	2	(a)The state provides aid for drivers and mechanics who attend workshops.
California	x						x			x	x		x	x	x			x	x		c½ d1	2	Districts may receive state transportation funds and, in addition, may charge students to ride the bus.
Colorado		x	x														x		x		b	b	Entitlement based on a flat grant per mile and 20% of any amount by which district's expenses exceed the per mile entitlement.
Connecticut	x	x	x							x		x							x		c1 d1½	2	Entitlement computation varies with type of board (local or regional). Within town transportation entitlement based on 50% of total cost (not to exceed $30 per pupil).

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/ Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/ Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Delaware	x			x					x												1	2	The maximum reimbursement is the amount computed on the basis of an approved district-operated formula or a contract formula.
Florida	x					x						x					x				2	2	The formula is recomputed annually.
Georgia	x		x						x		x			x	x	x	x	x	x		1½	1½	Allocations are based on information established by surveys conducted by the state transportation staff.
Hawaii					x																b	b	Pupil transportation is fully state funded and operated.
Idaho	x	x	x							x			x			x			x	ax	1½	1½	(a)Administrative allowance entitlement is 85% of the difference between the total allowable cost and the estimated proceeds of a tax levy of one mill applied to the adjusted value of taxable property, but it shall not exceed $10 per month per transported pupil.
Illinois	x		x							x		x	x						x		1½	1½	The minimum claim for a district is the formula amount or $16 times the ADM of transported pupils, whichever is greater.
Indiana	x					x				x		x									1	1	An eligible kindergarten pupil is counted as one-half an eligible pupil for reimbursement purposes.
Iowa				x															x		2	3	Transportation funds are included in the State Foundation Aid Formula and vary according to the district valuation.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Kansas	x			x			x					x							x		2½	2½	Entitlement is 100% of the formula per pupil cost or 100% of the per pupil cost, whichever is lower.
Kentucky	x						x					x							x		1	1	The state is divided into nine density groups.
Louisiana			x												x		x	x			1	1	Entitlement is based on a minimum salary schedule for bus drivers, which varies according to the bus size and the mileage driven.
Maine		x									x								x		2	2	In fiscal year 1979, transportation operating costs were based on 90% of prior year (one-year old) costs; and, in fiscal year 1980, it is to be based on 100% of base year (known two-year old) costs.
Maryland	x		x					x				x		x	x	x	x	x	x	[a]x	[e]½ [f]1	1½	[(a)]State provides an administrative allowance which includes salaries, travel, and inservice. The age of the bus is also a factor in computing local entitlement. Density is also a factor; however, it relates to a trip mileage allowance.
Massachusetts			x	x								x							x		1½	1½	The state reimburses the district the full amount expended for regional school transportation. Cities or towns are paid the sums required for approved expenses in excess of $5 per annum per pupil in the net average membership of such town.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Michigan		x										x		x			x		x		1½	1½	School bus depreciation and insurance are included as part of the district's allowable expenditures. The state reimburses up to 75% of allowable costs.
Minnesota	x						x			x		x	x						x	[a]x	1	1	Effective with the 1979-80 school year, the state adopted a new regression formula for computing local entitlement. Other factors considered in predicting a district's cost include area of district in square miles, ADM, and the (a)percent of enrollment transported.
Mississippi	x		x				x				x	x									1	1	The allocation is based on an amount per pupil according to a density rate schedule for each school district.
Missouri		x										x					x		[a]x		1	1	A district shall receive an amount not greater than 90% of the allowable costs with a ceiling of 125% of the state average of the second preceding school year. (a)Bus depreciation and insurance are included in the total allowable expenditures.
Montana			x												x		x			[a]x	3	3	Entitlement is based on $.40 per bus mile for fiscal year 1978 and $.45 for fiscal year 1979. (a)Rate may be adjusted according to size of bus and percentage of ridership in relation to bus capacity.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation)					Factors Used to Determine Local Entitlement															Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/ Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/ Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Nebraska			x									x									4	4	Transportation reimbursement is included as part of the Equalization Aid. The reimbursement is based on a flat rate per pupil, and the amount varies with the grade level of the student transported.
Nevada		x																	x		b	b	Eighty-five percent of the historic expenditures for pupil transportation is provided by the state. Actual expenditures for the previous two-year period serve as the base.
New Hampshire																							There is no state aid for pupil transportation.
New Jersey		x															x		x		2	2½	In 1979-80, the state paid 90% of the district's approved transportation cost.
New Mexico	x		x					x			x		x	x	x		x	x	x	[a]x	[g]1	[h]1½ [i]½	The state has a formula for privately owned school buses and a formula for school owned buses. (a)Administration and supervision allowance.
New York		x																	x		1½	1½	The state pays 90% of approved transportation costs. A school district may not receive more than 107% of the transportation paid in the previous year, however, there are exceptions for excess transportation costs.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/ Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/ Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
North Carolina				x				x				x					x			[a]x	1½	1½	(a)In effect, pupil transportation funds are allocated according to the needs of the school district.
North Dakota			x									x			x		x				b	b	The state pays a flat rate per mile and per pupil per day. The rate varies with the size of the bus.
Ohio			x								x	x					x				1	1	Local entitlement is based on a flat rate per pupil or per mile, whichever is greater. The state has a separate rate for board-operated buses and contracted service.
Oklahoma	x	x					x					x									1½	1½	1978-79 Formula: Per capita allowance x average daily haul x 110% = state aid for transportation (114% for 1979-80).
Oregon		x																	[a]x		b	b	The state pays 60% of the total approved transportation cost. (a)Bus depreciation and insurance are included in the approved cost total.
Pennsylvania	x		x							x		x	x	x	x		x	x	x	[a]x	1½	1½	The state uses two formulas: district-owned and operated transportation and pupil transportation by contract. (a)The age of the bus is a factor in the contracted reimbursement formula.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Rhode Island	x									x									x		b	b	Transportation expenses are a factor in determining state share ratios for calculating state aid annual entitlements and are included in total local expenditures for reimbursement.
South Carolina					x																b	b	The only cost to the local school district is for supervision.
South Dakota		x	x														x		x		b	b	The district entitlement is 50% of its net transportation cost but not more than $.30 per mile.
Tennessee			x									x								[a]x	1½	1½	Sixty percent of the total state transportation appropriation is allocated on a per student basis. Forty percent is allocated on the basis of a ratio of the geographic area of each county to the total geographic area of the state, as computed in (a)square miles.
Texas	x		x					x						x	x		x				2	2	For 1978-79 and thereafter, the base cost reimbursement for each bus shall be 105.2% multiplied by the allowable total base cost for each bus during the 1977-78 school year. Percentage increases and reductions are allowed for road conditions and mileage which deviates from the standard state bus route.
Utah	x			x		x						x					x		x		1½	2	The state uses a regression equation formula to compute local entitlement.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation)					Factors Used to Determine Local Entitlement															Distance Eligibility (Miles)		Remarks
	Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/ Operated	Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/ Bus Hours	Expenditures	Other	Elementary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Vermont																							Vermont does not provide categorical aid for regular school transportation. Reimbursements are provided for transportation in connection with special education or vocational education services.
Virginia			x									x		x			x				1	1½	The state transportation appropriation is distributed as follows: 40% of the total on the basis of number of pupils transported, 40% of the total on the basis of miles traveled, and 20% of the total on the number of buses meeting state standards.
Washington		x									x		x				x	x	x		2	2	The reimbursement rate is calculated using total statewide reimbursable costs and total state transportation funds available. Under current regulations, this rate could not exceed 90%.
West Virginia		x									x					x			x		b	b	The transportation allowance is the sum of the following: 80% of transportation cost, exclusive of salaries; total cost of insurance; 10% of replacement value of bus fleet; 80% of cost of contracted and public utility service; and aid in lieu of transportation equal to state average per pupil.

Table 4 (continued)

State	Fiscal Models (Basis for Allocation): Equalization Concept/Formula	Percentage Grant	Flat Grant	Approved Cost	State-Owned/ Operated	Factors Used to Determine Local Entitlement: Linear Density	Area Density	Road Conditions	Geographic Regions	Assessed Valuation	Bus Replacement	Number of Students Transported	Bus Depreciation	Number of Buses	Size of Buses	Bus Insurance	Bus Mileage	Driver Salaries/ Bus Hours	Expenditures	Other	Distance Eligibility (Miles): Elementary	Secondary	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Wisconsin			x									x								[a]x	b	b	[a]Distance pupil transported.
Wyoming		x									x								x		b	b	The state reimburses the district for 3/4 of total operation/ maintenance cost and 1/6 of total cost for capital outlay for buses.
TOTALS	21	16	21	7	2	3	8	4	2	9	10	24	8	9	10	4	20	7	29	10			

Source: The writer's survey of current state transportation programs.

(a) Refer to the remarks column for explanation.
(b) There was no reference to eligibility distance cited in the information received from the state.
(c) Grades K-3
(d) Grades 4-8
(e) Pre-kindergarten and kindergarten
(f) Grades 1-6
(g) Grades K-6
(h) Grades 7-9
(i) Grades 10-12

VITA

Gloria Whitehurst, daughter of Ray and Ann Wolfe, was born in Staunton, Virginia. She graduated from Robert E. Lee High School in 1963 and received a Bachelor of Science degree in Spanish and Biology from Radford University in 1967. In 1973 she was awarded a Master of Arts degree in Education from Virginia Polytechnic Institute and State University. In 1976, she was awarded the Certificate of Advanced Study by Virginia Polytechnic Institute and State University. In 1993 she was awarded the degree of Doctorate of Philosophy in Educational Administration by Virginia Polytechnic Institute and State University.

Ms. Whitehurst taught for one year at North Junior High in Newburgh, New York, two years at Natural Bridge High School in Natural Bridge, Virginia and three years at Auburn High School in Riner, Virginia.

While serving as a high school teacher, Ms. Whitehurst has been active in the National Education Association, the Virginia Education Association, the National Association of Educational Negotiators, the Montgomery County Education Association and Phi Delta Kappa.

Ms. Whitehurst has one daughter, Kelly Michele Whitehurst.

Gloria Wolfe Whitehurst

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