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ASSESSMENT OF SELECTED STATE AND COMMUNITY PROGRAMS

THE HIGHWAY SAFETY ACT OF 1966 SECTION 402

October 1973

DOT HS 802 509

This report is part of the reassessment of the State and Community Grant Program (Section 402 of the Highway Safety Act of 1966).

National Highway Traffic Safety Adminstration
Planning and Programming

FOREWORD

This Report is part of a reassessment of the State and Community Grant Program (Section 402 of the Highway Safety Act of 1966) being conducted by the National Highway Traffic Safety Administration. The information for this Report has been developed in cooperation with the Office of the Associate Administrator for Traffic Safety Programs and the NHTSA Regional Offices. This stage of the reassessment seeks to identify what was purchased with Federal grants and State and local matching resources from Fiscal 1968 through 1973, and to trace the effects which took place. Data on the Federally funded purchases of each State are in a computer system and are expected to be available for general access within a short time.

CONTENTS

INTRODUCTION

The Questions

Early in 1973 the Office of Management and Budget through the Office of the Secretary of Transportation posed a number of questions about the State and Community Program. This grant program, authorized under Section 402 of the Highway Safety Act of 1966, has over the past six years channeled more than 370 million dollars to the fifty States, the District of Columbia and the Commonwealth of Puerto Rico.1/ The money is to stimulate, improve and upgrade highway safety activities at the State and local levels. The Act requires that each State develop comprehensive highway safety plans based on broad standards (guidelines) issued by the Secretary of Transportation.

The key questions from the Office of Management and Budget about the State and Community grant program can be briefly summarized as follows:

- What did the grant money buy?
- How were the purchases used and what results were achieved?
- Are State efforts monitored and evaluated?

These questions must be viewed in the context of the Federal grant process. The money is distributed to the States on the basis of population and road mileage. Other than Federal approval of State Highway Safety plans, States have considerable flexibility in allocating and spending the funds as they see fit. Forty percent is earmarked, by law, for local use. It is a program in partnership with the States, where the Federal government is responsible for national leadership in highway safety and the Governors are responsible for their State program.

The Answers

This report tries to answer the three key questions. Specifically:

- We know in considerable detail what was bought with Federal funds in the fifty States, the District of Columbia, and Puerto Rico.
- We have analyzed certain effects of the Federal effort within State programs.
- We are now able to set up a monitoring system and a tentative analytic method for assessment.

1/ Amount obligated to NHTSA Standards as of 6-30-73.

The next section will cover the underlining concept, approach and problems in making an assessment of the grant program.

CONCEPTS AND APPROACH

Assessment Concepts for a Grant Program

State highway safety programs are a conglomeration of many programs and projects at the State and local level. Although the Highway Safety Program is a categorical grant, virtually every State department participates, e.g., motor vehicle, state police, education, public health, public works, and the judicial. Federal grant money is used in a wide variety of projects which are only a small portion of the States' total highway safety efforts. 2/

We believe that the determination of effectiveness - based on the direct causal relationship between Federal program input and accident reduction at the State and local level - is not feasible. It is our opinion that one can best measure the effects of Federal grants for highway safety by a systematic, step-by-step approach which will now be briefly described.

The Approach

Our approach to the assessment of the State and Community Highway Safety program is to trace what has happened through the following steps:

- What was bought with Federal funds.
- How much of a money match was made by the States.
- How were the purchased items used - what did this yield.
- What did the States and localities do in response to the Federal input - support, follow-on, expansion, increased efficiency, and shift of emphasis.
- Was the State action desirable, responsive, useful in some measurable way toward enhancing highway safety.
- What measures or indicators can be devised and used to reflect the output of the statewide highway safety program.

The last step requires a thorough job of compiling "output" measures for statewide and local highway safety programs. Examples of such measures would include the average response time for ambulances both in urban and

2/ A 1968 report to Congress estimated total State/local expenditures for highway safety at $1.9B in 1967. Most estimates conclude Federal funds constitute 3-4% of total highway safety expenditures.

rural areas in a State, the number of citations per patrol hour, and driver license suspensions per student with and without simulator training.

Some progress has been made in collecting this kind of information, yet a lot more needs to be done. Eventually an attempt might be made, using multi-factor regression analysis, to determine the kind of activities and the level of effort, within a particular environment, among a particular population and under certain economic constraints, necessary to show an association with changes in accident occurrence. This is not now possible.

All of the steps except the first and the last can be analyzed with measures or indicators that depict what we shall call "catalytic effects". This term will be used to describe progress in a State or local highway safety program such as:

- Creation of an activity to address specific problems
- Increased efficiency
- Follow-on, or "pick-up" of Federally funded projects
- Upgrading to meet Highway Standards
- Innovative use of Federal funds
- Use of Federal funds (Sec. 402) to continue demonstrated countermeasures (Under Section 403)
- Shift in emphasis, e.g., from operations support to training
- Phased, systematic approaches to project development and implementation.

The Scope

Five standard areas - Driver Education, Alcohol in Highway Safety, Traffic Records, Emergency Medical Services, and Police Traffic Services - were analyzed. They represent 80 percent of the funds obligated to the State and Community program. Data covering six years - FY 1968 through FY 1973 - were obtained for the fifty States, the District of Columbia and Puerto Rico.

Data files containing over 8,000 records were constructed and a quick access system via time-sharing terminal is operational. Within the next two to three months, Regional Offices will have the capability for using

this system to obtain data for each State, plus regional and national summaries. At the moment the system is limited to items bought with Federal funds, but it can be expanded to include statewide highway safety program data.

State Matching Funds

The Highway Safety Act of 1966 requires that there be fifty percent match by the States against Federal funds apportioned to the States.3/ The particular type of match can be roughly distinguished between "services-in-kind" (a soft match) and an allocation of actual funds (a hard match).

Services in kind are expenditures by States and local jurisdictions for their ongoing State or local safety efforts. The required 50 percent match is therefore composed of any one of the following combinations:

- All services-in-kind
- Services-in-kind plus allocated money
- All allocated money

Throughout this report the term "hard match" refers to new funds allocated by States to match Federal funds under Section 402.

Another term that is used is the "hard match ratio". This is the ratio of the actual cost of an item to its Federal cost portion. Actual cost here refers to Federal funds plus hard match funds allocated by the State.

An example of a hard match ratio computation is the case of a driving range which costs $40 thousand to install. If records show that the Federal fund portion was $30 thousand and that the remaining $10 thousand represents the State's money, the ratio of the actual cost ($40 thousand) to the Federal portion ($30 thousand), in this case 1.33, is the "hard match ratio".

These ratios are used throughout this report to give an indication of State and local money participation in the purchase of items for which Federal funds have been spent.

Some Problems in Analyzing Data

State and Local Program Data. Data on total State and local activity (not just activity supported by Federal funds) were hard to get in several standard areas. Much of the Statewide data that we were able to get were

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3/ The Federal-Aid Highway Act of 1970 reduced the required State match to thirty percent for all funds apportioned after June 1973. This Act also dropped (as of Dec. 31, 1970) the requirement for Standard-by-Standard matching and permitted the States to match on an aggregate basis.

incomplete in a number of ways. In some cases data for only certain States, and a limited number of years, were available. As a general rule we tried to obtain data from at least twenty States for extrapolation to represent the nation as a whole. This was not always possible. One solution to this problem may be a sampling system to survey representative areas to come up with national data on various aspects of Highway Safety.

Federal Grant Data. Once the job of data collection, coding, processing, and storage was accomplished, we intended to analyze the data using time series for the six-year period. This approach was difficult because States identified their projects by code numbers, using the Fiscal Year as the first two digits. Since a number of projects were planned to last for two or three years States identified project costs against the first year. This tended to inflate quantities and costs reported for 1968 and 1969, and conversely deflate data for 1970 and 1971.

To overcome this problem, we used cumulative values to show trends and magnitudes. In many analyses data were split into two three-year periods - FY 1968 to 1970 and FY 1971 to 1973 - since a review of the raw data showed this to be one useful alternative.

Financial Terms. Throughout the report the terms Federal "funds", "costs" and "expenditures" are used interchangeably. These are the amounts States "spent" for projects and items as determined by our data collection and coding effort. None of these terms is intended to represent accounting definitions of expenditures and obligations.

ASSESSMENT SUMMARY

Overview of Federal Grant Program

In the five standard areas, Fiscal Years 1968 through 1973, items costing over $315 million were bought. Over $240 million of that amount were Federal Grant Program funds (Section 402), yielding a hard match ratio of 1.32. Stated another way this means that for every Federal grant dollar the States put up 32 cents towards the actual cost of the purchase. In effect therefore Federal grant money paid for 76 percent of the actual cost.

The following table shows Federal Grant dollars, actual dollars and the resulting hard match ratio for each of the five Standard areas studied.

Costs and Hard Match Ratios by Standard Area (FY 1968 - 1973)

Standard	402 Grants $ (million)	Actual $ (millions)	Hard Match Ratio
Driver Education	65.4	76.6	1.2
Alcohol	19.6	25.5	1.3
Traffic Records	57.3	75.1	1.3
Emergency Medical Services	35.0	55.0	1.6
Police Traffic Services	63.5	82.8	1.3
Total (5 standards)	240.8	315.0	1.3

Driver Education

From FY 1968 to FY 1973 about $65 million in Federal funds and $11 million in State and local matching funds were spent in the Driver Education area.4/ These funds purchased the following:

- 670 driving simulators
- 240 driving ranges. Ranges and simulators allow the student to experience driving in a controlled atmosphere.
- Improvements on 23 existing ranges
- 1900 yearly salaries of driver education supervisors and instructors, a total of 412,000 mandays
- Driver education training for 100,000 people. Courses consisted of seminars/workshops, instructor scholarships, adult education programs, and National Safety Council Course.
- 63 new curriculum studies. These consisted of needs studies, evaluations of existing programs and development of new materials.
- Driver education support for 420,000 students - $12.3 million. These expenditures were confined to 11 States and were concentrated in three States - Texas, Kentucky and Colorado.

4/ Data from the NHTSA Program Information Reporting System shows that 26 States reported total expenditures of $132 million for Driver Education in FY 1972. Federal funds for these States in the same period constituted 4% of this amount.

The overall findings may be summarized as follows: the use of simulators and ranges has reduced instructor costs, thus reducing per student costs. A lower per student cost has enabled States to expand driver education to more students and more schools.

The following highlights support these findings:

- Ranges and simulators accounted for 32% of the Federal funds in Driver Education
- Federal funds ($7.3 million) were involved in 60% of the driving ranges constructed from FY 1968 to FY 1972
- Federal funds ($12.5 million) were involved in 64% of the simulators purchased from FY 1968 to FY 1972
- Studies in North Carolina, Minnesota, Alabama and Maryland indicate that simulators and ranges reduce instructor costs and thus per student costs. Preliminary reports from Oregon indicate that higher costs were experienced with simulation. However, this may be attributable to other factors (i.e., new accounting systems or new requirements).
- The percentage of schools offering driver education has risen from 79% in 1967 to 86% in 1972
- The percentage of eligible students receiving driver education has risen from 62% in 1967 to 73% in 1972.

Alcohol

$25.5 million in Federal grants and State matching funds were allocated from 1968 to 1973 to programs within the Highway Safety Standard of Alcohol. States made these key purchases:

- 299 directors and staff people to carry out State/local drinking-driver countermeasure programs
- 6,439 people received alcohol education training
- 14 Needs Studies to pinpoint specific countermeasures to combat the alcohol problem
- 5,450 breath test devices: plus 287 BAC lab technicians and 52 device instructors to implement their use
- 29,531 persons trained in the use of breath test devices, as a key means of enforcement and evidence collection

- 141 judicial personnel hired to process in part increases in State/local drunk driver case loads.

- $319 thousand allocated for public education efforts to reach drinking drivers and the general public.

- At least 21 local Alcohol Action Programs employing a system of alcohol countermeasures.

One approach in reviewing the use of Federal grants and State matching funds over the six-year period is to cast the individual State purchases into a constructive set of alcohol countermeasure phases:

- Planning and Administration

- Enforcement/Evidence Collection

- Judicial

- Rehabilitation

- Public Education

Viewed in this context, we see that these developments occurred:

- Emphasis on Needs Studies to pinpoint alcohol problems and useful countermeasure activities usually occurred in the early years, 1968 and 1969. This was followed by development of alcohol program staffs and training, particularly in 1972 and 1973.

- At least 21 local alcohol programs were funded starting in 1971, as States began to develop systematic programs to combat drinking-driver problems. Twenty-one is conservative; other State purchases no doubt aided additional systematic efforts. Alcohol Safety Action Projects (ASAP's, with Section 403 demonstration funding) no doubt influenced some efforts.

- Enforcement and evidence collection (primarily with breath testing devices) consumed 60 percent of Federal funds and State matches. Most States relied extensively on these devices to detect the presence of alcohol.

- Six States began to allocate Federal grants in 1971 for court personnel to handle higher alcohol case loads. However, just under four percent of Federal funds and State matches supported this activity.

- Although States allocated substantial resources to existing treatment and social agencies, no allocation of Federal grants and State matching funds under the Section 402 Program went for rehabilitation countermeasures.

- By a factor of almost three to one, public information efforts to deter drinking driving increased in 1972 - 1973 vs. the first four years. This represented one precent of total alcohol allocations.

- Although the States' matching funds share dropped from 36 cents per Federal dollar to 25 cents from 1968-1970 to 1971-1973, at the same time the States' allocation of Federal grants to the alcohol standard more than doubled -- from $6.4 million to $13.2 million. This reflects an increased awareness of this societal problem.

Traffic Records Systems

Between FY 1968 and FY 1973, over $57 million in Federal funds and $18 million in State and local matching funds were spent on traffic records systems. These funds purchased the following:

- 170 major units of ADP equipment in 36 States. These purchases and rentals helped give States the computer capacity to satisfy their informational requirements.

- The design and development of 109 traffic records systems in 37 States. These systems are used to collect and analyze data.

- The implementation of 70 designed traffic records systems in 27 States. This included the conversion of existing data to machine readable form and the integration of local systems into a compatible statewide system.

- Salaries of 620 new traffic records personnel, providing 29 States with 135,000 mandays of effort.

- 19 traffic records needs studies in 15 States.

- Training for 2,600 traffic records personnel. Federal grants paid for two-thirds of the total $34 million.

Ninety-two percent of the total Federal funds for traffic records was spent on systems design and development, implementation, and equipment purchases and rentals.

In 1969 an inventory was taken of all State traffic records systems. In 1972 another inventory was taken covering the same information but for only six States. Data for the six States compared with data for the rest of the States using the frequency of Federal grant involvement in

various development phases as the criterion of comparability. We concluded that the six States were reasonably representative of the nation as a whole.

A comparison of the six States in 1969 and 1972 showed higher levels of file capability, greater utilization of data, and wider availability to more users. Specifically, between 1969 and 1972 in the six States:

- The number of TRS users increased by 39%.
- 41% of the 90 file systems (means of processing data) became more automated.
- 44% of the storage media holding data changed to a more flexible medium (e.g., from magnetic tape to magnetic disc or data cells).
- 36% of the file systems improved their capability of analyzing data according to user specifications.
- 43% of the response media (e.g., compuger print-out or data terminal) changed to types giving more immediate response to inquiries.
- 52% of all files were computerized in 1972, versus 27% in 1969.
- 24% of all files had quick query capability (instanteous retrieval) in 1972, vs. 1% in 1969.

When the 1968-1970 period was compared with 1971-1973 several expenditure shifts were apparent. These shifts generally indicated the completion of initial systems development and the movement of funds into implementation and systems use. Specifically,

- Federal expenditures declined by 27%. This is attributable to declines in equipment expenditures (-61%) needs studies (-39%) and system design and development (-44%). Partially offsetting these decreases was a 114% increase in costs of implementation.
- The percentage of costs contributed by the States rose by 4%.
- Personnel costs decreased by 14%, indicating increased States responsibility for operating personnel. However, of the personnel being funded by the Federal funds, the Federal portion increased from 51% to 79% of the total.
- The number of personnel trained increased from 390 to 2,200. At the same time Federal costs increased by only 60% indicating increased State participation in this area.

Emergency Medical Services

What was bought with Federal funds

From FY 1968 to FY 1973 $35 million in Federal funds and $20 million in State and local matching funds were spent on Emergency Medical Services (EMS). These funds purchased the following:

- 2,200 ambulances at a Federal cost of $12.9 million (37% of Federal grant funds for EMS) and a State and local cost of $10.5 million.
- 400 salaries of State EMS coordinators and administrative staff workers - 99,000 man-hours of service.
- Training for 53,400 people in the 81-hour Basic Training Course for Emergency Medical Technicians.
- Training for 27,600 people in courses shorter than the 81-hour Basic Course
- 60 EMS surveys, plans, and evaluations
- 800 State and community communications systems and base stations - to coordinate communications among citizen requests, police emergency vehicles and hospitals.
- 2500 two-way radios for ambulances - for dispatches to ambulance and ambulance to hospital communication.
- $1.6 million worth of medical treatment equipment (rescusitators, defibrillations,etc.) for use in 37 States.
- 30 subsidies to private ambulance services - only 12 States ever subsidized private ambulance services. In general the practice has ceased.

Statewide EMS Activity

Data for each of the 50 States and the District of Columbia for 1967, 1969, 1971, 1972 and 1973 show the following national trends in EMS since 1967:

- A recent trend towards fewer ambulance services (a 5% decrease between 1972 and 1973).
- A 15% increase in the number of ambulances (22,460 in 1967 compared to 25,800 in 1973).
- A trend towards better equipped ambulances -- the percentage of ambulances with two-way radios jumped from 46% in 1967 to 65% in 1973.

- A 24% increase in the number of ambulance personnel (166,000 in 1967 and 206,800 in 1973).

- An improvement in the training qualifications of ambulance personnel -- the percentage of ambulance personnel with Red Cross, or better, training went from 52% in 1967 to 70% in 1973.

- The establishment of State organizations responsible for statewide EMS coordination and planning -- in 1966 only two States had a full time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have full-time EMS staffs.

Use of Federal funds and catalytic effects

The overall effect of Federal grants and State matching funds on EMS nationally falls into four areas:

- Creation of new activities

- Areas where the States have picked up funding on efforts initiated with Federal funds.

- Improved ambulance configuration.

- Improved training for EMS personnel.

Creation of New Activities

EMS Surveys and Plans. All 50 States, D.C. and Puerto Rico have had EMS surveys, and by the end of 1973, all States will have comprehensive EMS plans. Surveys and plans are important for the rational allocation of EMS resources. Such surveys and plans did not exist before 1967.

EMS Administrative staffs. In 1966 only 2 States had a full-time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have full-time EMS staffs.

Areas where the States have picked up funding

EMS surveys and Plans. Federal funds have paid for 55 EMS surveys and plans out of a total of 104. The States have paid for the remaining 49 studies.

State EMS Staffs. All 50 States, D.C. and Puerto Rico have full-time EMS staffs. In 1973 Federal funds helped to pay for the salaries of EMS staffs in 20 States. In others words, 32 States have picked up the funding of State EMS staffs.

Ambulance Configuration

- The percentage of limousine, hearse, and station wagon ambulances (designs generally lacking sufficient headroom for proper patient care) has decreased from an estimated 82% of total vehicles nationally in 1971 to an estimated 50% in 1973.

- Panel trucks, carryalls and travelalls (designs permitting four patient care) have increased from 10% of total emergency vehicles in 1971 to an estimated 35% in 1973.

- Federal funding requirements have been the major cause of these trends. Since 1968 a raised roof with 54 to 60 inches of headroom has been a requirement for Federal funding. Moreover, all ambulances Federally funded beginning in 1973 have had to meet the DOT ambulance design criteria which specify a design suitable to four patient care. All major manufacturers but one produce only vehicles that conform to DOT ambulance design criteria.

Improved EMS Training

- Since 1967 53,600 people (21% of the total 206,800 ambulance personnel nationally) have been trained in the 81-hour DOT Basic Training Course for Emergency Medical Technicians. This course encompasses the knowledge and skills required to perform all emergency medical care procedures short of those rendered by physicians or by paramedical personnel under the direct supervision of a physician.

- Since 1967 27,400 people have been trained in courses shorter than the 81-hour Basic Course.

- 45 States and D.C. have adopted the 81-hour Basic Course as standard for all ambulance personnel.

Police Traffic Services

From FY 1968-FY 1973, $63.5 million in Federal funds plus an additional $19.3 million in State and local matching funds were spent for Police Traffic Services (PTS). The following items were purchased:

- 50,000 police officers trained in traffic services accounting for 18% of the Federal funds in PTS.

- 430,000 mandays of police officer services accounting for 16% of the Federal funds in PTS.

- 71 local selective enforcement projects accounting for 10% of Federal funds. These projects were designed to make better use of police traffic service resources in innovative ways.

- 7,100 speed detection devices for traffic control and law enforcement with 10% of the Federal funds.

- 1,100 walkie-talkies, 2,100 two-way radios, 300 communications base stations and 22 State or city communications centers. These accounted for 8% of the Federal funds.

- In excess of 1,000 police cars and 465 motorcycles for use in traffic surveillance, accounting for 5.5% of the Federal funds.

- 50 helicopters and 12 fixed-wing aircraft for traffic surveillance and rescue work, accounting for 10% of the Federal funds.

The thrust of the analysis is to determine where and how Federal funds were used to enhance police traffic services requirements. The analysis follows this process:

- An estimate of police traffic services manpower 1968 to 1972, based on population, registered vehicles, road and vehicle mileage. A comparison of these requirements with the growth of enforcement manpower nationally.

- An estimate of resources (funds, vehicles, equipment, training) required to support the needed growth in police traffic services.

- How and where Federal funds were used to support this growth.

- How and where Federal funds were used to create new methods and operations, or shifts in emphasis.

From this analysis the following results were obtained:

- Based on the growth of population, registered vehicles, and road and vehicle mileage, police traffic services manpower should have increased a minimum of 3% from 1968-1972, all things being equal. However, such things as average speed, use of alcohol, younger drivers, night and weekend driving are on the rise.

- Police traffic service manpower represents, using a conservative estimate from State police data, approximately 30% of the total police force nationwide. The total nationwide police force, crime prevention as well as traffic services, increased 12% from 1968-1972. It would appear that the growth of traffic service manpower would have been between 3% and 12%.

- The Federal funds spent for personnel were used primarily to pay for additional police officers and for overtime pay of existing officers. From 1968-1970 to 1971-1973 the amount of Federal funds used for police officers decreased, while the number of mandays remained relatively constant. In keeping with the general increase of nationwide police, the lower cost per manday could reflect salaries of newer, less experienced officers rather than overtime pay for the existing force.

- Fewer people were trained in the 1971-1973 period, but at a greater cost to the Federal government. Since the ratio of Federal to State and local funds remained virtually the same, it would appear that the training cost per student increased. This may be explained by the inflationary factors present in the economy as well as the fact that the average course length increased. This type of upgrading could account for the increase in training cost per officer and it is consistent with the increase in the number of officers trained.

- The number of video-tape units increased almost 50% in the 1971-1973 period over the 1968-1970 period. It would appear that police agencies are using more sophisticated equipment to provide better enforcement and legal evidence.

- Police assistance equipment (extractor bars, blankets, etc.) increased in number by 300% and in Federal funds by 100% in the 1971-1973 versus 1968-1970 period. This suggests an upgrading of police agencies.

- There was a consistant decrease in hard match ratios for equipment indicating that the States have been contributing less of their funds to purchase equipment.

- Federal funds for local enforcement projects increased 120% in the 1971-1973 period contrasted with a 12% increase for the other major purchase categories combined. The States also allocated substantially more of their own funds to selective enforcement. The hard match ratio increased 34% in 1971-1973. States are shifting emphasis to selective enforcement, funding projects which are innovative and more comprehensive in approach.

DRIVER EDUCATION

Introduction

The Federal Highway Safety Act of 1966 established the Federal Government's responsibility in the area of driver education with its requirement that any approved State highway safety program "provide for comprehensive driver training programs including (1) the initiation of a State program for driver education in the school systems or for a significant expansion of such a program already in existence...; (2) the training of qualified school instructors and their certification...; (3) appropriate regulation of other driver training schools...; (4) adult driver training programs...; and (5) adequate research, development and procurement of practice driving facilities, simulators, and other similar teaching aids...".

These statements effectively became the basis for administering Federal funds (Section 402) in the driver education area. Since passage of the Act, every State has received Federal funds to initiate or improve an in-school program through the purchase of simulators, driver ranges and other training materials. Many States have used Federal funds to conduct teacher workshops or to provide scholarships for teachers to attend formal classes. Some States have used the funds to draft a curriculum guide for their programs.

What follows is an analysis of Federal efforts in the driver education area. An overview of Federal expenditures will be presented and specific items within driver education will be analyzed. "Catalytic effects" on State and local programs will be discussed and illustrated. Finally, conclusions and the implications of Federal funding in driver education will be drawn.

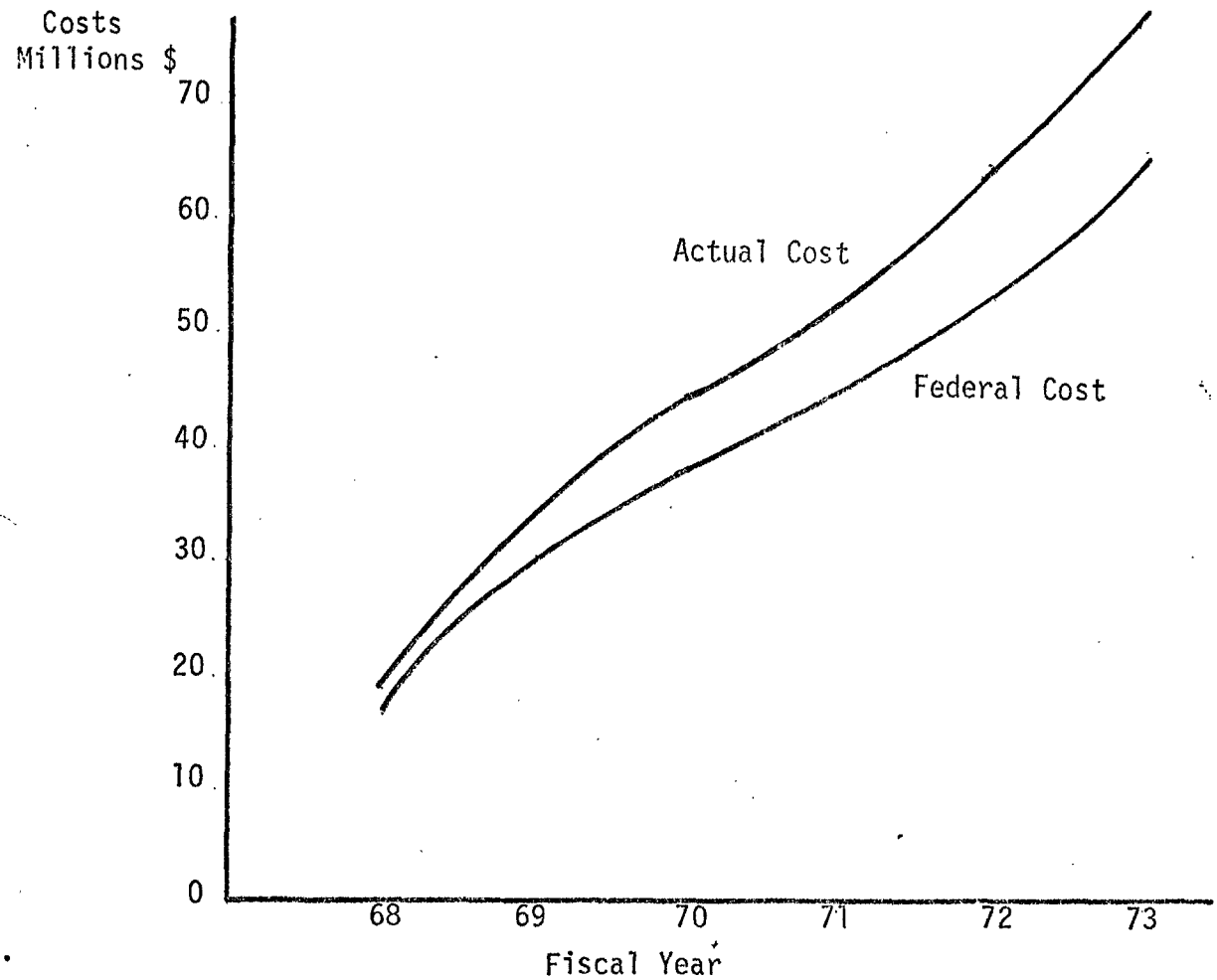
What Federal Funds Helped Buy

Introduction. Since its inception in 1968, Federal costs in the driver education field have exceeded $65 million. Actual costs, that is, Federal plus State/local matching portions have exceeded $76 million.

Figure 1 is a cumulative distribution of actual and Federal costs. The figure shows that Federal costs have risen from $16.5 million in 1968 to a six-year cumulative total of $65.4 million by 1973; actual costs have accumulated from $18 million to $76.6 million through 1973.

Figure 1

Federal and Actual Cost for Driver Education, 1968-1973



$44.9 Million or 69% of the Federal funds have been for the hiring and training of driver education personnel, ranges and related equipment, audio/visual material, simulators and curriculum development. These are areas in which students are directly affected, i.e., through more and better trained personnel and advanced hardware. The remaining $20.5 million was spent on related items such as rent, school bus personnel, and office equipment.

In this section, specific items within the driver education standard will be presented in more detail to discern trends that may have developed over the six-year period. The following areas will be dealt with: driver ranges, simulators, audio/visual equipment, driver education personnel, the training of driver education personnel, and curriculum development. Table 1 presents summary data for 69% of Federal Funds.

Table 1

Purchases Funded in Part or in Total
through Federal Grants for
Driver Education, FY 68 - FY 73

($ in Millions)

Item	Quantity	Federal Cost	State/Local Contributions	Actual Cost	Federal Share % of Actual	Item as % of Federal
EQUIPMENT						
Ranges						
New Construction 1/	244	7.34	1.53	8.87	83	12
Improvements/equipment	94	.64	.10	.74	86	01
Simulators	670	12.52	2.51	15.03	84	19
Audio/Visual 2/	1701	5.38	.53	5.91	91	08
PERSONNEL						
Salaries	(No./Mandays) 1930/412200	10.12	4.19	14.31	71	16
Training	(No. Trained) 99700	6.82	.32	7.14	96	11
CURRICULUM	63	2.09	.17	2.26	92	04
TOTALS		$44.91	$9.35	$54.26	83	69

1/ Includes Communications and Miscellaneous Equipment

2/ Includes Audio/Visual Equipment and Films

Equipment. Since 1968, 244 ranges have been constructed with Federal funds. In addition, Federal funds have been used to make improvements to 23 existing ranges as well as purchase 52 pieces of range communications equipment and 19 pieces of miscellaneous equipment for the ranges. In these projects the Federal share has been over 80%. The construction of ranges and related items has accounted for about 13% of the driver education standard funds. Nineteen States did not build any ranges with Federal grants. However, of these 19 States, 7 (Colorado, Michigan, Maine, Montana, North Dakota, Texas, and Vermont) constructed ranges with their own funds.

Simulators. Simulators constitute the second largest item as a percentage of Federal funds. Through FY 1973 the States purchased over 650 simulators at an actual cost of $15 million. All States but five (Alaska, Arkansas, Hawaii, Maine, and Nevada) purchased simulators with Federal funds.

Audio/Visual. The last major item is audio/visual equipment such as projectors and tape recorders, and driver education films. Table 2 presents the pertinent information.

Table 2

Audio/Visual Equipment and Driver Education Films Financed in Part or in Total with Federal Funds FY 68 - FY 73

($ in Millions)

Item	Federal Cost	Actual Cost	Federal as % of Actual
Audio/Visual Equipment	$ 4.65	$ 5.00	93
Driver Education Films	.84	.90	93

In each case the Federal share amounted to 93 percent of the actual cost. Fifteen States did not purchase any audio/visual equipment and over half the States did not purchase any driver education films.

Personnel. Personnel fell into four areas: driver education supervisors, driver education instructors, school bus administrators and school bus instructors. Since the latter two categories are relatively minor in terms of funds expended they will be omitted from the analysis. Table 3 presents the data on driver education supervisors and instructors.

Table 3

Driver Education Instructors and Supervisors
Financed in Part or in Total with
Federal Funds FY 68 - FY 73

($ in Millions)

Personnel	No./Mandays	Federal Cost	Actual Cost	Federal as % of Actual
Supervisors	270 / 64,400	$ 2.83	$ 3.22	88
Instructors	1660 /347,800	7.29	11.09	66
Totals	1930 /412,200	10.12	14.31	71

Since 1968 about 270 driver education supervisors have been employed generating over 64,000 man-days of service. Federal funding constituted about $11,400 of the annual salaries averaging $12,900. In other words, the Federal Government paid about 88% of the cost. About 1660 driver education instructors were employed for 347,800 man-days of service with Federal funds constituting about $5400 of an average salary of $8,300. The Federal portion was only 66% indicating strong State and local support in this area.

Training. The following courses have been grouped together for further analysis: Driver Education Expansion Course, Driver Education Instructor Scholarships, Driver Education Workshops/Seminars, Defensive Driving Course (National Safety Council), and Adult Driver Training Program. In the six years that the Federal program has been in existence, almost 100,000 people have been trained in some phase of driver education at an average cost to the Federal Government of $70 per student. Table 4 presents the pertinent data on training.

Table 4

Driver Education Training Financed
in Part or in Total with
Federal Funds (Sec. 402) FY 68 - FY 73

($ in Millions)

Course	No. Trained	Federal Cost	Actual Cost	Federal as % of Actual
Experimental Course	3,200	$ 3.8	$ 3.8	100
Instructor Scholarships	8,900	2.08	2.30	91
Seminars/Workshops	14,300	1.35	1.40	97
Defensive Driver Course (NSC)	8,800	.44	.44	100
Adult Program	64,500	2.58	2.62	99
Totals	99,700	$ 6.82	$ 7.14	96

Three of the courses, the Experimental Course, the Defensive Driver Course (NSC) and Adult Program were virtually 100% financed by the Federal Government indicating little commitment by the States in these areas. Only Driver Education Instructor Scholarships had less than 95% Federal participation and even this is substantially above the Driver Education Standard average of 83% Federal participation.

Curriculum Development. About 30 of the States have engaged in some form of curriculum development with the assistance of Federal funding. These efforts ranged from minor evaluations costing $1,000 - $2,000 upwards to major studies costing $250,000. Table 5 presents the various types of studies that have been done.

Table 5

Curriculum Studies Financed
in Part or in Total with
Federal Funds (Sec. 402) FY 68 - FY 73

($ Hundred Thousands)

Study	No.	Federal Cost	Actual Cost	Federal as % of Actual
Driver Education Evaluation	9	8.0	8.0	90
Driver Education Needs Study	4	.3	.3	100
Driver Education Curriculum Development	50	12.6	13.3	95
Total	63	$ 20.9	$ 22.6	92

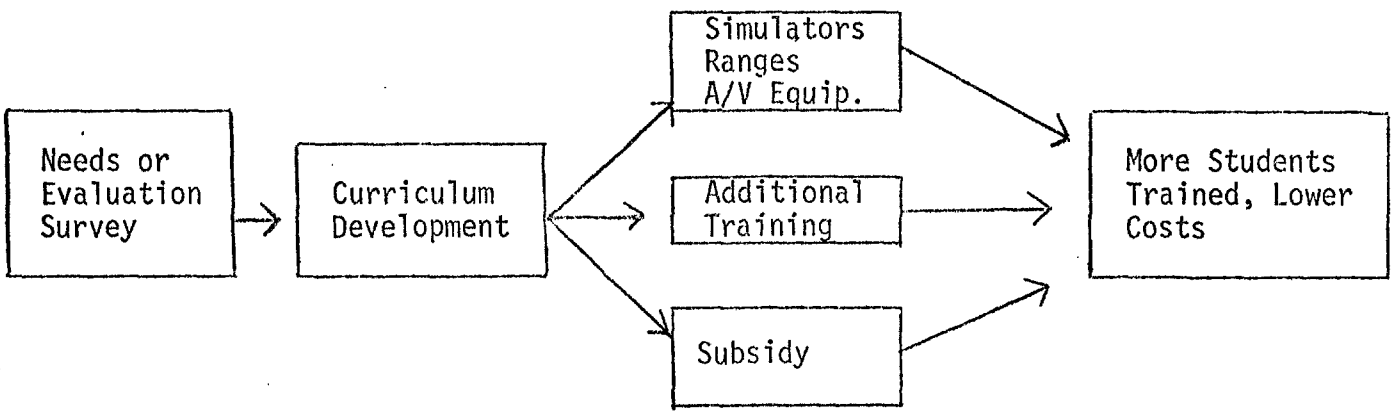
Student Driver Education Support. This area deserves mentioning, if not for its approach, then for its financial importance. Since 1968, over $16 million has been expended in this area on 420,000 students for an average of $40 per student. Although large, these expenditures have been confined to only 11 States and Texas alone accounts for $12.3 million of the total ($8.4 million in 1968). In addition, Colorado and Kentucky account for an additional $1.9 million. To summarize, student driver education support is confined to only a few States and among the States utilizing this funding method it is concentrated among Colorado, Kentucky and Texas.

CATALYTIC EFFECTS

Introduction

In this section, "catalytic effects" will be defined and discussed in terms of the data available from the States. State data are available on the number of students trained as far back as 1960. Data on ranges, simulators and the number of schools offering driver education are available from 1965-onward. In the post 1967 data, several States failed to supply the necessary information so linear projections have been used to fill in the missing portions. Because of this projection technique, this data must be analyzed with caution and any conclusions that are reached must be regarded as tentative.

A "catalytic effect" might be defined as actions by State/local governments that result from stimulus by the Federal Government. We might further define a catalytic effect to be one in which State and local governments enhance and expand their driver education program beyond the point they would in the absence of Federal interest in this area. This might include such things as increasing the number of students trained, increasing the number of schools offering driver education, increased use of simulators, ranges, or multi-media equipment, additional training of driver education personnel or curriculum development. Diagramatically, we might envision the driver education area in the following manner:



Federal stimulus to driver education might occur at any point in the chain depending upon the state of the driver education program in a particular State. For example, in a State that has an established driver education program, the catalysts might be in the hardware or personnel areas, i.e., new equipment and/or additional training for driver education instructors. In States where driver education programs are weak or nonexistant, the catalysts might be in the areas of needs survey and curriculum development. Obviously the requirements and conditions will vary from State to State, and where a State expends its funds in the driver education area will depend upon local conditions.

In the section that follows, it will be shown how a typical catalytic effect may occur. First, it will be shown how ranges and simulators may reduce per student costs. With reduced costs, States may then increase their driver education efforts as measured by the percentage of eligible students receiving driver education and by the percentage of schools offering driver education.

Simulators and Ranges. During the past few years technological changes and innovations have affected driver education in the form of driving ranges and simulators. Simulator consist of "simulated driver compartments with realistic controls connected electronically to an interpretation device so that teachers may be aware of the actions taken by students or how they react to audiovisual presentations, specially prepared for such use".1/

A range may be defined as "a facility that permits several vehicles to be operated simultaneously on a specially designed off-street facility. The student-operated vehicles are under the direction of one teacher outside the vehicle.2/

The reasons for their growing popularity are not hard to understand; both methods allow per student costs to be reduced. This is done through the substitution of capital for labor; in other words per student costs can be brought down by economizing on the use of relatively expensive inputs, instructors, and substituting capital, ranges and simulators, in their place.

1/ NHTSA Highway Safety Program Manual, Volume 4, Appendix B, 1969, p B2.

2/ Maryland State Department of Education, The Multiple Car Method, Baltimore, 1970, p 1.

Later in this report the magnitude of the savings will be discussed. Table 6 shows the number of driver ranges in various States.

Table 6

Driver Ranges in the States, 1965-72*

Year	No. of Ranges
1965-1966	360
1966-1967	373
1967-1968	464
1969-1970	468
1970-1971	697
1971-1972	730

*No data were collected for 1968-69

During the period 1968-1972, a nationwide total of 339 new driving ranges were constructed. Of this number, 201 were constructed with Federal grant funds. In other words, Federal funding was involved in 69% of the ranges constructed during the period 1968-1972. It should be noted that these figures reflect only new construction and it must be remembered that an additional $640,000 in Federal funds was expended from 1968-73 on driver range communications equipment, improvements and miscellaneous equipment.

Table 7 shows the simulators in use in the several States for the year 1965-72.

Table 7

Simulators in Use in the Various States, 1965-72*

Year	No. of Simulators
1965-1966	755
1966-1967	1003
1967-1968	1157
1969-1970	1857
1970-1971	2046
1971-1972	2091

*No data were collected for 1968-69

From 1968-1972 about 930 simulators have been purchased nationwide; of this figure about 592 or 64% were purchased with Federal funds.

As has been mentioned earlier, the main reason for the growing popularity and increased usage of simulators and ranges has been the fact that they reduce per student costs. In other words, it is more economical to invest in ranges and simulators and thus be able to use less relatively scarce labor (as indicated by its high price relative to the price of capital) more efficiently.

Although cost information is sketchy and definitive time series are lacking available information indicates that both ranges and simulator can reduce per student costs. A Maryland study concluded that "the multiple-car method (ranges) can save a school system approximately 30 percent of an instructor's salary. The percentage of savings is dependent upon the number of automobiles on the driving facility."[3/] Chart 1 gives an illustrative breakdown of costs between conventional (30 hours classroom and 6 hours on the road) and range (30 hours classroom, 6 hours on the range, and 3 hours on the road) methods.

Chart 1

Cost Comparison
Using
Conventional and Range Methods

Conventional (30-6) Total Hours for 30 Students	Range (30-6-3) Total Hours for 30 Students
30 hours class	30 hours class
180 hours driving	30 hours range
	90 hours driving (road)
220 total hours	150 total hours
@$6 an hour	@$6 an hour
$1,260 cost/class of 30	$900 cost/class of 30

The chart indicates that a 28% savings can be realized through the use of ranges in this particular example. The Maryland study concludes, "over a three-to-five year period, the savings will pay for major portion of the driving range construction expenditures." [4/]

3/ Ibid, p2.
4/ Ibid, p4.

The Maryland study further points out that school systems should be of some minimum size so that the ranges will not be underutilized, thus raising per student costs. In this regard, the report concludes "a small school with a five or six car range must guarantee an enrollment of at least 250 students at all times. If two or more schools share one range facility, and if the range is utilized by summer and after-school programs the danger of under-enrollment can be avoided." 5/ Similarly, the use of simulators may reduce driver education costs. A 1972 report from Alabama makes the point most succintly when it states "to reduce the total cost of a driver education program, there must be a decrease in instructional hours. One way to reduce instructional hours is through the use of simulators." 6/ Specific estimates as to the savings vary from State to State; for example, Alabama estimates that for a group of 200 students, 1,200 instructional hours are required in the traditional 30-6 format. Through the use of simulation, the number of instructional hours may be reduced to 800, a time savings of 33%. The difference of 400 instructional hours can be multiplied by the compiled hourly instructor's rate to determine exact financial data and program savings.

Similar studies in Minnesota and North Carolina indicate that various school districts reduced personnel costs by up to 37.5% through the use of simulators. In one State, Oregon, however, preliminary studies indicate that simulators raised per student costs. In a report it concludes: [in Portland]"the program cost more than doubled when simulators were added, from $36.08 per student in 1970-71 (no simulators) to $73.90 in 1971-72. Eighteen other districts also experienced cost increases, in 11 cases ranging from 30% to 300% higher than the year before simulation was added." 7/ But the Oregon report is also cognizant of the limitations inherent in such an evaluation when it states "the foregoing discussion cannot be defended as an adequate evaluation of the effect of simulation on driver education program costs. Because of the presence of many other variables that would require simultaneous evaluation in any accurate analysis, valid conclusions pertaining to only one variable - simulation - are not possible." 8/

In general it may be concluded that in most cases ranges and simulation reduce per student costs, and although definitive data are lacking, available data indicate this to be the case.

Measurement of Catalytic Effects

To determine effects of driver education training some quantifiable measures must be defined and developed. One possible measure is the number of students trained, i.e., if the number of students trained is increasing it might be inferred that driver education training efforts are increasing. However,

5/ Ibid, p.5
6/ Alabama Program Information Reporting System (PIRS) 1973, p.5
7/ Oregon PIRS, 1973, p.6
8/ Ibid, p.7

this approach fails to take into account that the number of potential students may be increasing at a greater rate than the number of students trained. Thus one might erroneously conclude that driver education is becoming more effective when in fact it is not. Using the ratio of the number of students trained to the number of potential students effectively circumvents the above-mentioned problems, and this criterion will be used in this analysis. Through the use of ratio or percentages it may be inferred that driver education efforts are increasing if the ratio increases. Table 8 is a time series of the percentage of eligible students trained for the years 1959-1972.

Table 8

Percentage of Eligible Students Trained
1959-72*

Year	Percentage
1959-60	34
1960-61	39
1961-62	44
1962-63	39
1963-64	42
1964-65	45
1965-66	50
1966-67	56
1967-68	62
1969-70	61
1970-71	60
1971-72	73

* No data were collected for the year 1968/69

Analyzing the data presented in Table 8, it is evident that there has been a steady increase in the percentage of students receiving driver education training. In the academic year 1959-60 only 34% of the eligible students received driver education training; by the 1971-72 academic year this figure had more than doubled to 73%.

Although it would be fallacious to attribute increases in driver education efforts solely to Federal funding, nonetheless, it may be plausibly argued that the increases were greater than would have occurred otherwise in the absence of Federal funding.

Just as the percentage of students taking driver education has increased, so has the percentage of schools offering driver education increased. This is shown in Table 9.

Table 9

Percentage of Schools Offering Driver Education
1965-1972*

Year	Percentage
1965-66	70
1966-67	74
1967-68	79
1969-70	84
1970-71	85
1971-72	86

* No data were collected for 1968/69

Table 9 indicates that the percentage of schools offering driver education has been increasing: in 1965-66 only 70% of the potential number of schools were offering driver education while in 1971-72 the percentage had increased to 86. Once again, it is not possible to attribute the increase solely to Federal funding expecially in light of the fact that pre-1966 data are not available, but nevertheless one may reasonably conclude that the availability of Federal monies has had some effect on the number of schools offering driver education.

ALCOHOL AND HIGHWAY SAFETY

Introduction

Objectives

The basic intent of the Highway Safety Standard for Alcohol is aimed at improvement in several areas. One is to ensure that States and local communities know to what extent alcohol is a factor in their jurisdiction's highway crashes. Ideally this information would guide State and local officials in allocating resources to combat the drinking-driving problem, and to help them determine the effects of alcohol countermeasures after implementation.

The alcohol standard has these additional specific objectives:

- Legislation which requires blood alcohol concentration (BAC) chemical tests
- Legal minimums of BAC which serve as presumptive evidence of driving under the influence of alcohol
- Implied consent legislation which ensures license revocation after arrest for drinking-driving, if the driver refuses the BAC test
- BAC tests on fatally injured drivers and pedestrians
- Standardized qualifications for BAC testers, testing and reports of findings

One may construe the major intent or objective of Federal grants for the alcohol standard as an incentive or seed money to the States -- to encourage them to broaden the scope and number of their alcohol directed activities.

Countermeasure Phases

In part Federal funds should permit some use of innovative countermeasures to reduce alcohol-related accidents. The important first step in this effort would be identification of drinking drivers before accidents occur. At the very least States need to be able to state with precision when alcohol is present as a factor in accidents.

Under a new or improved system of countermeasures, each State would provide for identification of drinking drivers to the courts and to licensing agencies. Procedures to reduce their drinking-driving could then be entered into. This might involve, for example, a follow-up program of a punative or theraputic nature.

In many respects this constitutes a phased approach to the problem, utilizing a system of countermeasures. It would be essential that new countermeasure activities be phased in with existing, widespread State programs and agencies. Many are already running throughout the States, whether or not they were created originally to handle alcohol problems. In this report we recognize that the Federal grants which are the subject of our reassessment may represent a small part of many States' approach to the problem of alcohol in highway use.

In line with a systematic or phased use of countermeasures as briefly outlined above, data relating to the alcohol standard area will be analyzed in this report. We will look at what States purchased with Federal grants over the past six years, the extent to which they matched Federal dollars with State dollars, and what State responses or catalytic effects may have occurred.

Overview of Federal Grant Purchases

Nationwide View

This section's presentation of the data on Federal grants and matchi State funds for alcohol related purchases consists of categorizing purchases -- all vehicles, people, equipment, training and the like. Our initial analysis concerns the range of Federal grant amounts, t proportional funding share allocated to each category and items wit categories, key purchases and the leading States responsible, and th degree States used their own funds to match Federal grants.

Table 1

Alcohol Program Costs
FY 1968-1973
($ thousands)

Category	Federal Grants	State & Local Matches	Actual Costs1/	Ratio of Federal Costs To Actual	Hard Match Ratio	Perc Alc Cos
1. Alcohol Related Equipment	$ 7,137	$1,368	$ 8,505	84.0%	1.19	33.
2. Personnel	5,892	1,883	7,775	75.8	1.32	30.
3. Training	3,156	946	4,102	76.9	1.30	16.
4. Alcohol Action Programs	2,781	1,455	4,236	65.7	1.52	16.
5. Other (studies, vehicles, etc.)	800	104	904	88.5	1.13	3.
	$19,768	$5,754	$25,522	77.5%	1.29	100

1/ Actual costs reflect the Federal grant plus the State/local dolla match.

In the major cost categories from FY 1968 to FY 1973, the States' decisions on allocation of Federal Section 402 grants ranged from $7.1 million for equipment (basically breath test devices) to $2.8 million for 21 local alcohol action programs. Equipment by far received the largest allocation -- 33 percent of joint Federal grants - State matches. Breath testers consumed 78 percent of this $7.1 million. If you include instructors and training necessary to bring testing into enforcement operations, this single program area represents 50 percent of the total Section 402 grants in the alcohol standard.

The overall hard match ratio through FY 1973 was 1.29 -- the States on the whole contributed 29 cents to accompany each Federal dollar they allocated to their alcohol efforts. The lowest match ratio of 1.19 was in the highest cost area, equipment, while the high ratio of 1.52 occurred in the local alcohol programs.

Viewed a second way, the Federal grant as a portion of total program activity ranged from 65 percent for equipment up to 84 percent for the local programs. Overall, States contributed just under 25 percent of the actual costs during the six-year period, as shown in Figure 1.

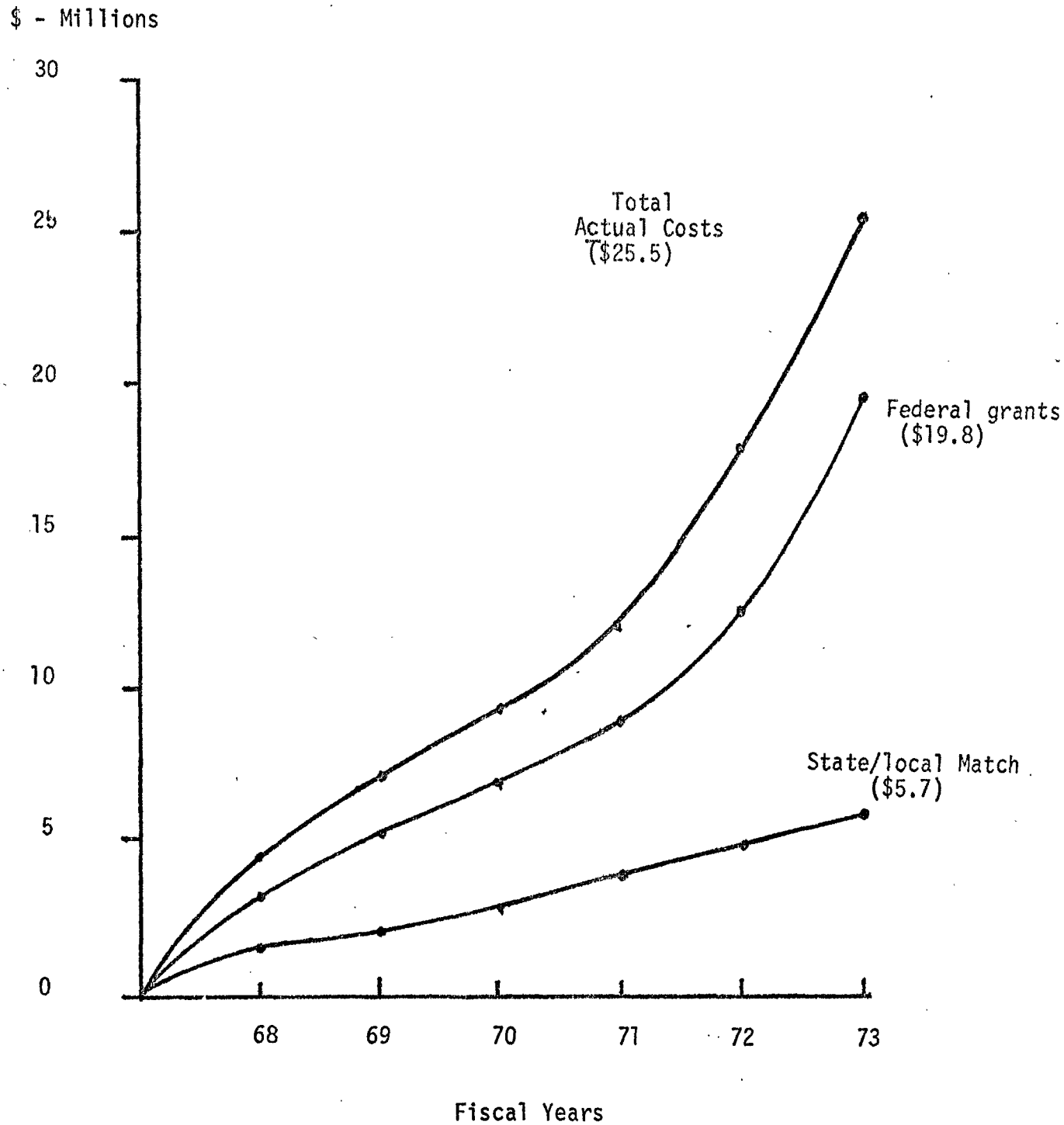
State Matches

Before moving into a more indepth review of each major category of cost, it is important to note the following: The 402 program grants represented only a small part of most States' approach to the drinking-driver problem, and thus the low hard match ratio can be highly deceiving when assessing where States are allocating their own budget resources independently of 402 funds. This is true even though the program activities touched by each are often the same. Thus, in ensuing sections where the match ratios are described in order to better size what Section 402 funds bought, the large and varied agencies and programs already supported by the States must be kept in mind. In later sections, an additional dimension -- catalytic effects -- is applied to this dilemma. There we will be focusing on the use of 402 funds and State matches in innovative ways. The use and not so much the match will become the prime factor. In addition, we will join the review of the gross data with information on particular States which have taken the lead in particular program or countermeasure areas.

A series of tables on subsequent pages expands the overall cost data presented in Table 1. For example, Table 2 shows each basic type of breath test device purchased from FY 1968 to FY 1973 with Federal grants and State matches. Table 3 adds a further dimension to Table 2 by indicating funds for BAC laboratory technicians and breath test instructors necessary to compliment the use of such equipment in highway enforcement efforts.

Figure 1

Cumulative Alcohol Costs



Alcohol Related Equipment

Table 2

Equipment
FY 1968-1973
($ thousands)

Category Cost Item	Total Units Purchased	Federal Grant	Actual Cost	Ratio of Federal To Actual
Breath testers - Portable	2084	1,795	2,095	86%
Breath Testers - Stationary	1498	1,478	1,661	89
Breath testers - Laboratory	741	696	964	72
Breath Test Simulators	1127	476	524	91
Video Tape Equipment	499	826	868	95
Audio-Visual Equipment	6	481	481	100
Miscellaneous Equipment	-	1,385	1,912	73
		$7,137	$ 8,505	84%

All forms of enforcement and evidence collection accounted for 80 percent of the Federal grants and State matches earmarked for alcohol programs over the last six years. Sixty-two percent of the Federal grants for alcohol went into this countermeasure. These are both conservative estimates; neither includes both State and Federal funds expended on local alcohol programs' enforcement activities (to be discussed later). Breath-testing equipment and back-up laboratory expenses made up 78 percent of the enforcement grant/match level.

Practically all States allocated at least Federal funds to these testing devices. Over 5450 was purchased during the six years. The following chart presents the leading State for each basic type of device, as well as for BAC technicians in State and local laboratories. Each top State led the others in both number of units purchased and funding. The degree to which these leaders matched Federal funds with State dollars is also indicated:

Purchase	Leading State	Ratio	Next States (Units)	
Portable	Texas (307)	2.00	Virginia (282),	Michigan (220)
Stationary	Illinois (314)	1.00	New Jersey (220)	Kentucky (196)
Laboratory	Ohio (387)	2.00	Arizona (100),	Georgia (70)
Simulator	Florida (350)	1.00	New York (302)	Kentucky (201)
Technicians	Georgia (160)	1.74	Arkansas (19)	Tennessee (17)

Alcohol involvement in traffic accidents remains at such high levels for many States, that their responses have almost always been, during the six years we examined, in enforcement countermeasures.

Personnel in Alcohol Programs

Table 3
Personnel
FY 1968-1973
($ thousands)

Category Cost Item	Number of people	Federal Grant	Actual Costs	Ratio of Federal to Actual
Program Administration	299	$3,026	$3,515	86%
BAC Lab technician	287	1,493	2,315	64
Police Personnel	88	468	516	91
Breath Test Instructors	52	279	372	75
Court DWI Personnel	141	565	928	61
Miscellaneous Personnel	-	61	129	48
		$5,892	$7,775	76%

Over the six-year period, personnel to run alcohol programs, conduct breath tests and alcohol enforcement, and court personnel handling DWI cases consumed 31 percent of Federal and State match funds for the alcohol standard. States in fact treated personnel as the second highest category by earmarking 30 percent of their Federal grants for it.

Almost half the total funds went for staffs for State and local alcohol programs. BAC technicians used the next highest amount, necessitated by the heavy purchase of breath testing units in most States. Together these two personnel categories account for 76 percent of the actual costs.

In the later years some States began to allocate more Federal dollars and State matches for hiring court personnel associated strictly with drinking-driver cases. Georgia accounted for 70 percent of this activity.

The ratio of State matches and Federal grants remained stable over the six years -- at 1.32 for both FT 1968-1970 and FY 1971-1973. Despite a much heavier allocation of Federal funds into this area of cost in the last three years, States continued to match Federal funds at the same level.

Training for Alcohol Programs

Table 4

Training
FY 1968-1973
($ thousands)

Category Cost Item	Persons Trained	Federal Grant	Actual Cost	Ratio of Federal To Actual
Breath Test Training	29,531	$ 2,479	$ 3,380	73%
Alcohol Education Workshops	6,439	450	495	91
Alcohol Enforcement Instruction	1,464	204	204	100
Traffic Services, Etc.	25	23	23	100
		$ 3,156	$ 4,102	78%

Over the six years the States allocated 16 percent of the Federal grants/State matches to training people in various segments of their alcohol programs. The range of Federal dollars was between 73 percent for breath test training (which used 82 percent of the total funds) to 100 percent for alcohol enforcement instruction (the least expensive training).

Viewing the States' use of funds for training, one is presented with both positive and negative results. While States began to offer more training to alcohol programs staffs (in line with increased hiring of these specialist, especially in the last three years), their share of the costs declined over the six year period. Their overall hard match ratio was 1.30. Despite the fact that Federal funds carried an increased share of the cost burden, States were willing to allocate more of their Federal resources to training in an effort to enhance alcohol staffs which were being formed in increased numbers.

Table 5

Local Alcohol Action Programs
FY 1968-1973
($ thousands)

Category Cost Item	Number of Programs	Federal Grant	Actual Costs	Ratio of Federal To Actual
Local Alcohol Programs	21	$2,781	$4,236	66%

Local programs received 17 percent of the Federal grant/State funds, and 14 percent of Federal grants alone. This category accounted for the highest match ratio -- 1.52 -- of the alcohol categories.

Our analysis pinpointed 21 programs receiving Federal and State match funding, starting in FY 1971. Six States participated, and Texas with 12 programs hard matched Federal grants dollar for dollar.

These 21 programs understate the probable level of local activity. The Section 402 funds we pinpointed are no doubt quite conservative. They do not consider that funds in other categories may in fact have supplemented other States' local efforts, or State creation and funding of local countermeasure areas such as rehabilitation which did not receive Section 402 grants were funded strictly from State resources.

As time progressed, an interesting situation developed: the programs themselves became more expensive, moving from an average cost of $95 thousand in 1971 to $392 thousand in 1973. This is one indication that State/local programs to deal with drinking drivers were probably composed of more personnel and more countermeasure activities. This infers a healthy shift toward more intensive efforts to solve the alcohol problem.

Statewide Alcohol Program

Statewide Data

Our major emphasis in collecting statewide data was two-fold: To define the problem, that is, the degree to which alcohol is a factor in highway crashes; and to see steps States are taking with their own funds irrespective of Federal grants to solve it.

These data would help us define the environment in which State and local alcohol programs have been developed.

For example, we have attempted to collect data as a start in these areas:

- Accidents with alcohol involvement
- Alcohol arrests
- Convictions

We have obtained alcohol-related crash data for almost half the States for 1970 through 1972, and earlier data are available as well. A fair number of States are also reporting these data for 1973 on a monthly basis.

The overall problem which State and local alcohol programs are addressing can be stated simply: State data show that alcohol involvement remains a decidedly major factor in all types of highway accidents -- fatal, personal injury, property damage -- and constitutes at least 40 percent of particular States' fatal crashes.

Assessing the degree of alcohol involvement can be difficult, and data on this problem are not collected, maintained or reported in any overall uniform manner. The National Safety Council suggests one means by identifying drinking as a contributory cause to accidents. Nonetheless, many States do not report this alcohol involvement, and an unknown number of accidents each year are not investigated or reported properly. This retards any State-by-State overall view toward deciphering the exact role alcohol plays.

In recognition of this estimated incidence, however, most States have responded by allocating most of their Federal grant for the alcohol standard to the countermeasures of enforcement and evidence collection. This will be discussed in detail later when we examine States' actions with various countermeasures.

The problem of instituting countermeasures cuts across a number of State and local agencies. This sharing of responsibilities indeed adds further difficulty to obtaining program and results data. The following outline represents minimum general information and quantified data which should be available to assist indepth work on the effects States are having:

- Alcohol related accidents
  - both driver and predestrian involvement
- Special enforcement patrols and arrests
- BAC test activities and BAC levels
- Court procedures to handle alcohol cases
  - staffing patterns
  - conviction data
  - effects of BAC test evidence
  - pre-sentence investigations
  - probation follow-up
- Rehabilitation programs
  - existing efforts and new developments
  - level of alcohol referrals and treatment approaches
  - treatment follow-up
  - recidivism patterns
- Public education programs and approaches
  - evaluation data on their effects

Federal Funds: State Catalytic Effects

Countermeasure Phases

This section examines State actions using Federal funds and matching State resources within a framework of alcohol program phases or countermeasure areas. Ideally an alcohol program is systematized into these phases:

- Program Planning and Administration
- Enforcement/Evidence Collection
- Judicial
- Rehabilitation
- Public Education/Information

Local Alcohol Action Programs will be reviewed separately. These probably consisted of some or all of the phases, and to the degree they arranged these into a system, they may well have been influenced by ASAP's -- Alcohol Safety Action Projects begun several years ago and carried out in 35 States with demonstration funding (Section 403).

Table 6 (presented next) shows nationwide use of Federal funds/matching State funds for each phase and the local programs. For example, 60 percent of the funds flowed into enforcement and evidence collection. This percentage is somewhat misleading: significant State action with local alcohol programs since fiscal 1971, using 402 funds, resulted in additional enforcement activity, as well as funds for the other phases.

Table 6

Alcohol Program Phases
$ thousands
FY 1968-1973

Phases/ Programs	Federal Costs	State Match	Total Costs	Ratio of Federal Cost To Total	"Hard Match Ratio"
1. Program Administration	$ 4,076	$ 515	$ 4,591	88.8%	1.13
2. Enforcement/ Evidence	12,132	3,367	15,499	78.3	1.28
3. Judicial	566	370	936	60.5	1.65
4. Public Information	213	47	260	81.9	1.22
5. Local Alcohol Action Programs	2,781	1,455	4,236	65.7	1.52
Total	$19,768	$ 5,754	$25,522	77.5%	1.29

While States emphasized enforcement from FY 1968 through 1970 (and continued to do so in the past three years), the other phases received growing emphasis in the past three years. These trends, and the specific details behind them, are shown in later tables.

The nationwide summary shown above should be viewed in this context: State allocation of 402 funds to the alcohol standard area rose from $6.4 million (1968-1970) to $13.2 million (1971-1973). The States' decisions to more than double these particular funds for their alcohol programs is significant of their thinking regarding the drinking-driver problem.

Program Planning/Administration

The first phase in establishing any systematic program to reduce alcohol involvement in accidents usually involves the creation of program staffs in each participating State or locality and conducting what is termed a Needs Study. Through such studies States can pinpoint problems of high blood alcohol concentration, or BAC, in drivers. This in turn suggests activities within countermeasure areas that require development, and further helps to determine timing, physical placement and benchmarks for later evaluations. Over the six-year period 18 percent of the Federal/State match funds went into this phase. Table 7 presents the allocation of Federal funds for fiscals 1968-1970 and 1971-1973:

Table 7

Program Planning and Administration
($ thousands)

Cost Item	FY 1968-1970 Units	Federal Grants	Hard Match Ratio	FY 1971-1973 Units	Federal Grants	Hard Match Ratio
Program Staff	88	$ 836	1.49	211	$2,191	1.04
Alcohol Education	712	58	1.83	5,737	422	1.00
Needs Study	8	175	1.04	6	321	1.07
		$1,069	1.34		$2,934	1.03

As States geared up their alcohol countermeasures, the need for program coordinators and staffs increased. Table 7 indicates 70 percent of the personnel (but 90 percent of the man years of effort) were purchased during 1972 and 1973. This upturn was generated by six States (Kentucky, Maryland, Michigan, Mississippi, New Jersey and Nebraska) and Puerto Rico. For the six years, however, only New Jersey allocated any matching funds for these personnel. Despite an apparent dependance on the Federal grant, States were no doubt paying other salaries in the alcohol areas solely with their own funds. And local alcohol programs, where the leading State, Texas made significant hard matches, required additional staff members.

Table 8

Administration/Planning: Program Shifts
FY 1968-1970 vs. FY 1971-1973
($ thousands)

	Units	Federal Grants	Actual Cost	Hard Match Ratio
Program Staff	(+1.4 times)	(+1.6 times)	+82%	-30%
Alcohol Education	(7 fold)	(+6.3 times)	(+5 fold)	-45%
Needs Studies	-25%	+84%	(+2 fold)	+ 3%
		(+1.75 times)	+100%	-23%

Table 8 indicates that States were choosing to devote more of their Federal resources to both staffs and their education. To prepare for alcohol programs, Needs Studies funded with Federal grants/State matches were conducted for the most part in the early years of the 402 program. California allocated more than half of these funds, with smaller sums earmarked by Alabama, North Carolina and Utah.

Training of State and local alcohol personnel in alcohol education workshops constitute the third major element in the administration and planning phase. Almost 6500 people have been trained with Federal funds and State matches since 1968, with well over 90 percent trained since FY 1972. The major participating State was Michigan (above with over two-thirds of the total costs), followed by Washington and Connecticut and ten others.

Looking back, Needs Studies to guide program development predominated in the early years of the 402 program, usually occurring in 1968 and 1969. Some alcohol staffs were formed in those years, but the bulk of salaries paid with 402 funds and State matches was in 1972 and 1973. Training in alcohol education followed suit.

Enforcement/Evidence Collection

The second phase of a State or local alcohol program involves enforcement and evidence collection for the judicial phase. In terms of joint Federal-State cost in the 402 program, this was the most emphasized phase of the alcohol program.

Within the enforcement phase, the most important activity involved breath test devices -- including the purchase of portable and stationary devices, the training of enforcement personnel in their use, and the hiring of instructors and BAC lab technicians:

Breath Testing

Item	Federal Cost	Total Cost	Match Ratio
Devices	$4.440M	$5.240M	1.18
Training	2.480	3.380	1.36
Instructors	.280	.370	1.33
Technicians	1.490	2.320	1.55
	$ 8.700M	$11.310M	1.30

The total cost of $11.3 million represents some 73 percent of the total costs. Of all enforcement activities, the use of breath testers and the necessary back-up personnel and training in their use received the widest attention from most States, and this activity was employed by almost all States. However, it was always the pattern that a few States would account for the majority of the purchases:

- Of 2,096 portable breath testers, 809 were purchased by three States: Texas, Virginia and Michigan
- 730 of 1,498 stationary testing devices went to three States: Illinois, New Jersey and Kentucky
- Of 741 laboratory testers, 387 went to one State -- Ohio
- 652 of 1157 testing simulators went to Florida and New York
- 160 of 287 BAC technicians were hired by Georgia.

The leading States normally matched the Federal grant with their own funds. From this can be inferred that Federal funds were not interpreted simply as a subsidy. The use of this equipment represents a unique, innovative approach to acquiring evidence. Conviction rates normally go up in alcohol cases. States recognized this and used both Federal and State dollars to achieve it.

Table 9 provides a summary view of the major enforcement and evidence activities, again employing the device of three-year comparisons. The concept of enforcement now presented is broadened to include other means -- police, video-tape equipment (for further evidence collection) and lab supplies which in part back up testing activities:

Table 9

Enforcement/Evidence Phase
($ thousands)

	FY 1968-1970			FY 1971-1973		
	Units	Federal Grant	Hard Match Ratio	Units	Federal Grant	Hard Match Ratio
Police Cars	7	14	2.00	26	$ 130	1.00
Police Officers	25	88	1.44	63	380	1.02
BAC Lab Technicians	165	517	1.31	122	878	1.87
Breath Test Instructors	29	124	1.53	23	156	1.18
Portable Breath Testers	1263	1020	1.26	833	779	1.22
Stationary Testers	616	501	1.26	882	978	1.06
Laboratory Testers	641	505	1.49	100	192	1.14
Breath Test Simulators	628	150	1.30	329	327	1.01
Lab Supplies	-	731	1.32	-	383	1.11
Video Tape Equipment	307	320	1.40	194	461	1.14
Audio Visual Equipment	2	7	1.00	4	474	1.00
Breath Test Training	12,163	1194	1.65	17,368	1286	1.10
Alcohol Enforcement Training	15	12	1.04	1,449	192	1.00
		$ 5,183	1.41		$6,616	1.20

These three-year comparisons suggest that:

- Breath testing continues as the most emphasized element in enforcement using Federal funds and State matches, with notable increases in persons trained in testing and enforcement.

- Enforcement using special alcohol patrols increased in the last three years, as did the use of video taping of depositions in alcohol cases for later use in the judicial phase.

- Alcohol enforcement continues to consume the largest portion of the Federal grant/State match funds. However, State matches have slipped from 38 cents per Federal dollar to 19 cents.

Table 10 summarizes the 3-year comparisons in Table 9 in order to show the relative changes in the last three years:

Table 10

Enforcement: Funding Shifts
FY 1968-1970 vs. FY 1971-1973
($ thousands)

	Units	Federal Grants	Actual Costs	Hard Match Ratio
Police Cars	(+3.7 times)	(+8.2 times)	(+3.6 times)	-50%
Police Officers	(+1.5 times)	(+3.4 times)	(+3.3 fold)	-29%
BAC Lab Tech.	-26%	+70%	(+1.4 times)	+70%
Breath Test Instructors	-21%	+30%	- 3%	-23%
Portable Breath Testers	-34%	-30%	-26%	- 4%
Stationary Testers	+43%	+100%	+64%	-16%
Laboratory Testers	-84%	-60%	-71%	-23%
Breath Test Simulators	-48%	(+1.18 times)	+68%	-22%
Lab Supplies	-	-48%	-56%	-16%
Video Tape Equipment	-37%	+44%	+17%	-19%
Audio Visual Equipment 1/	-	-	-	-
Breath Test Training	+43%	+ 7%	-28%	-33%
Alcohol Enforcement trng.	(+100 fold)	(+15 fold)	(+12 fold)	- 3%
Total		+30%	+ 8%	-14%

1/ Actual costs increased from $7 thousand to $474 thousand and Federal grants provided 100 percent of the funding.

While Table 10 does indicate that State hard match ratios declined by an overall 14 percent in the past three years, this occurred in a context of increased allocations of funds in the alcohol area. The funding decisions by the States themselves resulted in more than double the allocation of Federal grants since 1971.

There was one notable exception to the downturn in State matches: the hard match ratio for BAC laboratory technicians (the third highest cost) increased by 70 percent in the past three years. At the same time States increased total allocations of funds to this one item by 140 percent. A parallel increase in the number of persons trained in breath testing -- up 43 percent since 1971 -- also took place. In fact, training in overall alcohol enforcement showed a 100 fold increase during the same time. Police officers and vehicles for special alcohol patrols also rose sharply.

The majority of breath testing equipment bought with Federal grants/ State matches was purchased by 1971. It was very logical that support for those units -- technicians, training, patrols -- would also begin an upturn. Employed together, these items are essential in increasing detection and conviction of drinking drivers. Most States made the same response in this area.

Judicial Phase

Normally it would be expected that a heavy emphasis on enforcement would necessitate a rapid, proportional build-up in the judicial phase, if only to process a projected increase in the number of DWI citations. An examination of alcohol costs under the 402 Program within this phase, from 1968 through 1973, shows just the opposite pattern. The joint State-Federal costs in this phase totalled $936,000 by 1973, with 92 percent of this amount occurring in the past two years. The balance of eight percent was spread from 1968 through 1971.

Nevertheless, as Table 11 shows, States in the past three years have begun to beef up the judicial phase using Federal funds and State matches to handle the increased alcohol case load. It must be remembered that States support extensive judicial systems with their own funds. Despite this the States which chose to allocate Federal grants to this countermeasure area achieved a high hard match ratio -- in fact the best of all the phases.

Table 11

Judicial Phase
$ thousands

Cost Item	FY 1968-1970 Units	Actual Cost	Hard Match Ratio	FY 1971-1973 Units	Actual Costs	Hard Match Ratio
Court Administrators	-0-	-0-	-	5	50	2.00
Court Clerks	-0-	-0-	-	102	387	2.15
Pre-Sentence Investigators	-0-	-0-	-	15	191	1.00
Probation Officers	-0-	-0-	-	-0-	-0-	-
Prosecutors	5	66	1.00	15	304	1.98
		$ 66	1.00		$932	1.86

The use of Federal grants and matching State funds was not widespread among the States in this phase -- six States and the District of Columbia over the six years. This phase in fact consumed less than four percent of the alcohol funds reported spent under the Section 402 program. However, better than 90 percent of the activity has occurred in the last three years, which does indicate some improvement.

This absence of States is further compounded by the unequal distribution of activity among the six States. Georgia accounted for 74 percent of the costs by paying for five court administrators and 100 court clerks. New Jersey accounted for 15 percent. In all categories of court personnel -- whether administrators, clerks, pre-sentence investigators, probation officers or prosecutors -- only the equivalent of 141 annual salaries paid one year each was accounted for during 1968-1972. Two States alone, Georgia and New Jersey, accounted for 89 percent of these costs.

As in the other phases, these figures may be slightly conservative. Alcohol standard funds to local programs mentioned earlier, and which will be examined later in this report, may well have flowed in part to the judicial phase of the respective programs. No conclusive data are available to us at this time to support or deny this point.

Public Education/Information

The fourth phase of a State or local alcohol program might be termed the public education or information phase. Certain media campaigns, for example, are enforcement oriented, aimed at the drinking-driver with threats of arrest, prosecution and quite conceivably an eventual accident. Others attempt to reach the families or others close to the drinker-driver. This countermeasure received the smallest portion of Federal grants/State matches -- one percent, $260 thousand. Again, this should be caveated with the fact that local alcohol programs (covered next) may well have allocated a portion of their funds to the education countermeasure. This is also exclusive of alcohol training received in Driver Education.

As in the judicial phase, a few States accounted for the bulk of the activity. Georgia and New Mexico together accounted for 66 percent of the joint State-Federal costs. However, both the total funds allocated and the State matches have increased in the last three years. Table 12 presents this shift in activity in recent years:

Table 12

Public Education/Information
$ thousands

	FY 1968-1970			FY 1971-1973		
Cost Item	Units	Federal Grant	Ratio Match Ratio	Units	Federal Grants	Hard Match Ratio
Information Staff	4	$39	1.00	3	$ 20	1.00
Published Materials	3	28	1.04	8	126	1.37
		$67	1.02		$146	1.32

Table 12 indicates in two ways that States have begun to turn toward greater emphasis on public information as a countermeasure. First, the portion of Federal funds allocated increased by 118 percent in the last three years, and second, the States' match of these Federal dollars increased by 30 percent.

Local Alcohol Action Programs

A systematic approach to reducing alcohol involvement in highway accidents is a relatively new development. The States' use of 402 funds and their own matches for these programs ostensibly began in FY 1971, as Table 13 indicates. However, it is possible that the individual purchases discussed in the previous phases may well have been input to additional local programs.

Table 13

Local Alcohol Action Programs
$ thousands

Cost Item	FY 1968-1970 Units	Actual Costs	Hard Match Ratio	FY 1971-1973 Units	Actual Costs	Hard Match Ratio
Local Programs	-0-	-0-	-	21	$4,236	1.52

The 21 local programs funded with Federal grants and State matches occurred in either FY 1971, 1972 or 1973 -- the time period of most of the ASAP program. It may well be that the ASAP's influenced the creation of the State projects.

Six States developed these 21 local programs: California, Maryland, Nebraska, Pennsylvania, Texas and Virginia. Texas alone accounted for over half the six-year cost of $4.2 million. With the exception of Texas (which matched dollar-for-dollar all Federal grants it allocated to its 12 local programs), the remaining States showed no shift toward assuming any of the cost burden.

It must be emphasized at this point that the number of local alcohol programs which operate with combined Federal and State funds is quite likely well above the twenty-one we have pinpointed. Louisiana, for example used Federal funds under the police traffic services standard in fiscal 1971 to create a safety school for DWI referrals. Our data

for 1973 suggest they probably have eight local programs going. Federal funds and State money were allocated in 1973 for overtime and operating costs for 52 State and local police, 14 breath testing devices and 14 police cars. It may be that a portion of these purchases were made for local programs which also employ the safety schools. Combined with the judicial and rehabilitation institutions which Louisiana already funds, these could well constitute a phased approach to alcohol involvement in crashes.

TRAFFIC RECORDS SYSTEMS

Introduction

Objectives, Purpose and Standard Description

The operation of a highway safety program depends, to a considerable degree, on the existence and quality of comprehensive traffic records systems (TRS) at the State and local levels. Such systems, to be useful for action and analysis, must include series of data elements relating to the driver, the vehicle and the roadway environment.

The TRS standard specifies certain minimum information and system capabilities for the following operating goals:

- Improved response time to priority police requests for vehicle and driver information.
- Efficient deployment of enforcement personnel.
- Detection of highway engineering needs.
- Countermeasure evaluation.
- Support of presentence investigations and sentencing.
- Assistance of vehicle registration and denials.
- Benefit to consumers - information on recalls and periodic motor vehicle inspections.

The types of data in a traffic records system, to support the operating goals, would reflect the following sample items:

- Driver - Personal identification, address, driving history.
- Vehicle - Characteristics and identification, history, and ownership.
- Accidents - Time, place, apparent cause, violations, driver/occupant involvement.
- Roadway - Physical condition, environmental data.

Finally, system characteristics should include:

- Controls to avoid delays in retrieving data.
- Data or visual response for priority requests.
- Compatibility between State and local systems.
- Capability for summary listing and statistical treatment.

The Scope of Traffic Records Systems Assessment

This paper will cover three aspects of Traffic Records Systems:

- An overview of what was bought - by the States - with the aid of Federal grants, under Section 402 of the Highway Safety Act of 1966.
- An examination of Statewide operations and programs including when and where Federal grant funds were used.
- An analysis of the use and effects of Federal grants in State licensing programs on
  - changes over time and improvements in systems toward standard guidelines
  - State responses, particularly in the assumption of funding and further development.

Federal Grant Aided Purchases

Overview of Costs

In the six-year period - FY 68 through FY 73 - Federal funds spent in the traffic records systems area amounted to $57.2 million. The States' match toward the total cost of items bought was $17.9 million - yielding a hard match ratio of 1.3.

Expenditures fall into seven basic groups:

1. Surveys of Needs and Requirements - studies, plans and proposals defining the scope of traffic records systems.
2. Systems Design and Development.

3. Systems Implementation.

4. ADP Equipment - rental and purchase, including computer time, support equipment and supplies.

5. Traffic Records Personnel - Analysts, data clerks, operators, programmers, key punch operators.

6. Training - for operating personnel.

7. Misc. Items (this amounted to 1.5% of the total)

Summary by group

Table 1 presents aggregate quantity and cost information for the 50 States, the District of Columbia and Puerto Rico.

Table 1

Total Costs
TRS Standard
FY 1968 - FY 1973
($ Millions)

	Quantity	Federal Cost	State/Local Portion	Actual Cost	Percent Federal of Total	Hard Match Ratio
1. Survey of Needs and Requirements	19 surveys	.46	.11	.57	80.7	1.2
2. Systems Design and Development	109 systems	10.39	2.27	12.66	82.0	1.2
3. System Implementation	70 systems	16.24	4.20	20.44	79.5	1.3
4. ADP Equipment and Supplies	170 major units	25.86	9.21	35.07	73.7	1.3
5. Traffic Records Personnel	120 hired (135,000 mandays)	3.14	1.98	5.12	61.3	1.6
6. Training	2598 trained	.23	.11	.34	67.6	1.5
7. Other		.86	.04	.90	95.8	1.0
Total		57.18	17.92	75.10	75.7	1.3

The largest expenditures were for ADP equipment. At $25.9 million this represents 45 percent of the Federal cost in the TRS standard area. Purchases were spread throughout the States, with 42 States buying (or renting) at least one major piece of ADP hardware.

When purchases aided by Federal grants which involved system initiation (i.e., Systems Development, Implementation, and Equipment) are added, they total some $52.5 million, or 92 percent of Federal costs. In this series of groups, the costs were once again spread throughout most States, as 43 States participated in at least one systems design or implementation, with 27 States participating in more than one.

While only 19 needs surveys were reported, it seems likely that this task was included as a part of systems design or fully funded by the States themselves.

State Traffic Records Programs

State System Inventories

In 1969 inventories of State traffic records systems were taken by NHTSA. The following types of information were recorded for each State:

- Number of data files in the system.
- Which files were either partially or fully automated.
- Whether the files were individually amenable, or in groups, compatible for computerized analyses.
- Whether a file could be "quick query" accessed.
- The size, completeness and accuracy of each file.
- The specific data items in each file.

Another inventory was made in 1972 covering the same information, but only for six States - Alabama, Florida, Louisiana, Oklahoma, South Carolina and Texas. Such a relatively small sample would in most cases not represent State trends. An attempt was made, however, to check the development of phases for the six States and compare them to the rest of the States, using frequency of Federal grant involvement for each fiscal year as a criterion. The method and results are described in the next section.

Development Phases - A Typical Scenario

Before enactment of the Highway Safety Act of 1966 each State did have a traffic records system. Most of these were not sufficient for the development, operation or evaluation of a comprehensive highway safety program. To conform to the TRS standard, State systems since 1967 proceeded along the following development phases:

1. Conducting a survey of needs - to be satisfied by a redesigned TRS.

2. Design and development of a TRS to meet the most immediate data demands, and capable of expansion to serve future requirements. Compatible statewide forms for accident reports and traffic citations are designed at this stage.

3. State implementation of designed systems, coverting existing data to machine readable form and integrating local systems into a compatible statewide system.

4. Computer equipment purchases or rentals and placement into ADP facilities. Supplies and supporting equipment are readied for full operation.

5. Simultaneously, additional personnel are hired and/or trained to run the system.

Most States go through these development phases periodically or even continuously - successive iterations - to upgrade and/or expand their TRS. Table 2, on the following page shows the number of States that used Federal funds for each phase of the typical scenario, in a particular year. The table is in two parts: the top represents the six States inventoried in 1972 and the bottom, the remaining States.

Table 2

Number of States that used Federal Funds
for Development Phases in each Fiscal Year

Development Phases	FY 1968	1969	1970	1971	1972	1973	Total	Percent
(Six Sample States inventoried in 1972)								
1. Survey of Needs	-	1	-	-	-	-	1	2.4
2. Syst. Des. & Dev.	2	1	-	-	-	-	3	7.3
3. Implementation	1	1	2	1	3	2	10	24.4
4. Equipment	2	2	3	1	5	4	17	41.5
5. Personnel	2	2	2	1	3	-	10	24.4
Total	7	7	7	3	11	6	41	
Percent	17.1	17.1	17.1	7.3	26.8	14.6		
(44 States, D.C. and Puerto Rico)								
1. Survey of Needs	4	4	2	2	2	3	17	5.5
2. Syst. Des. & Dev.	14	15	5	6	20	19	79	25.1
3. Implementation	5	9	6	8	15	14	57	18.1
4. Equipment	14	22	19	13	18	13	99	31.4
5. Personnel	7	11	11	8	13	13	63	20.0
Total	44	61	43	37	68	62	315	
Percent	14.0	19.4	13.6	11.7	21.6	19.7		

The pattern of distribution - defined by the percentages - both for development phases and fiscal years is relatively similar between the six States and the rest. The major difference between the two sets of States is in the use of Federal funds for systems design. Some of the six States report using Federal funds only in 1968 and 69, although they may have supported this themselves - using Federal funds more for equipment, and implementation.

If, on the other hand, the six States placed less emphasis on systems design and development - a necessary step toward TRS improvement - then any measured progress between 1969 and 1972 may well be on the conservative side when the six States are used as a sample for all States.

Use and Effect of Federal grants in State Programs

Traffic Records Systems - Estimate of States' Progress

On the assumption that changes in State systems among the six States between 1969 and 1972 are representative - and we believe this to be reasonable - an analysis of progress was made. To do this, common system characteristics were evaluated for improvements between 1969 and 1972. The characteristics and criteria are listed below:

Characteristic	Criteria
1. File system - manual, punch card, or computerized	1. Did file system advance along these lines?
2. Data storage - paper forms, microfilm, punch card, magnetic tape, disc, cell	2. Did storage medium advance to more flexible stage?
3. Type of ADP equipment	3. Was capacity increased? Advances to new generation computer?
4. Organizations using file data	4. Did number of users increase?
5. Data sources	5. Did number of sources increase?
6. Data elements	6. Did number of elements increase? (a minimum of 3, to register an improvement)
7. File entries	7. Did number of entries increase?
8. Response media - typed information copy, photocopy, oral answer, hard copy, teletype, batch print, interactive terminal.	8. Did response media shift to more direct access mode?
9. Reports - summary and analytic	9. Did system incorporate report production capability after 1969?

10. Frequency of summaries	10. Did frequency increase, e.g., quarterly vs. annually.
11. Data coverage in files	11. Are files more complete?
12. Data accuracy	12. Did accuracy improve?
13. Out-of-State data	13. Did files add out-of-State driver, vehicle and accident data?

The 1972 inventory gave detailed information on changes based on these characteristics and criteria. A summary of results is shown in Table 3.

Table 3

Summary of changes in TRS
for 6 States - 1972 vs 1969

	No. of Data Files				
	Driver	Vehicle	Accident	Highway	Total
Total files - 1969	33	31	21	5	90
Total files - 1972	28	36	20	6	90
Discontinued Files	10	4	3	0	17
New Files	4	8	2	1	15
No. of Syst. Characteristics Improvements in:					
° File System	12	17	7	1	37 (41%)
° Storage Media	13	17	8	2	40 (44%)
° Response Media	12	20	6	1	39 (43%)
° Summary & Analysis Report Capability	10	13	8	1	32 (36%)

The improvements generally were in increased systems capability, particularly in data file type, flexibility and retrieval methods. Most improvements were in vehicle and driver data banks, implying an increasing concentration of analytic interest in these areas.

Another example of changes in the TRS of the 6 States' inventories is their degree of computerization and "quick query" capability for certain data files. Table 4 illustrates this.

Table 4

Computerization and Quick Query[1/] Capabilities
- six States -

	1969		1972	
	No.	% of Files	No.	% of Files
Total No. of Files	90	100	90	100
No. Computerized	24	27	47	52
No. with Quick Query Capability	1	1	22	24

The data handling improvements infer better data file support and thereby an enhanced analytical capability.

The inventory and survey of the six States' systems also noted a sharp rise in the number of data users - tending to confirm the greater value of data to potential users with the improved system. Overall, the groups and organizations using data from the system increased by 39%. Local governments, who were not among the users of the system in 1969 (in our six States), now list ten users. Most other categories of users also showed significantly higher use of data.

1/ Quick query - The capability of equipment to access data in a complete file and retrieve relevent information instantaneously.

Table 5

Number of users of Data
By user category 1/
- six States -

User Category	No. users in 1969	No. users in 1972	% Increase
General Public	44	52	
Private Business	51	40	
Law Enforcement	120	181	
Other Federal Users	28	52	
State Agencies	105	133	
Local Govt.	0	10	
Total	338	468	38.6%

Analysis of Federal Expenditure Patterns

More than $57 million in Federal grant aid was spent on traffic records by the States since inception of the program. The following analysis will focus on both the apparent shift in the use of Federal funds over time, and the degree of follow-on support by the States.

Table 5 on the next page breaks up purchases with Federal funds into two 3-year segments (FY 1968-70 and FY 1971-73). The apparent shift in Federal involvement between these time periods, as well as among the previously described development phases, is discussed below.

Overall Change. While Federal grant aid use dropped by 27 percent in the second 3-year period, the money match by States increased slightly (4 percent). This was influenced primarily by the shift in the equipment phase of development.

1/ The term "users" means the individual organizations and agencies making use of the data.

Table 6

Shift in use of Federal Grant Aid among
TRS Development Phases - all States, D.C. and P.R.

Phases	1968-70 Quantity	1968-70 Federal Cost ($ 000)	1968-70 Hard Match Ratio	1971-73 Quantity	1971-73 Federal Cost ($ 000)	1971-73 Hard Match Ratio	Change Quantity	Change Federal Cost ($000)	Change Hard Match Ratio
1. Needs Studies	12	287	1.23	7	175	1.22	-42%	-39%	-
2. Syst. Design & Development	52	6,750	1.20	57	3,760	1.27	+10%	-44%	+6%
3. Implementation	25 systems	5,179	1.14	45	11,066	1.36	+80%	+114%	+19%
4. Equipment	96 units	18,748	1.32	74	7,276	1.36	-23%	- 61%	+ 3%
5. (a) Personnel	339 (74,800 mandays)	1,683	1.95	280 (60,000 mandays)	1,454	1.26	-17%	-14%	-35%
(b) Training	386 Trained	89	1.13	2212	143	1.68	5.6 fold increase	+61%	+49%
Total		32,736 1/	1.29		23,874	1.34		-27%	+ 4%

1/ Combined totals, FY 68-73 represent 99% of Federal costs reported.

Development Phases. The major shifts since the FY 1968-1970 period are from needs studies, and in part from systems design, to implementation. Federal grant use for the latter more than doubled, as did the number of traffic records systems implemented. States increased their money match in this phase by 19 percent.

Equipment purchases dropped in the second period and it appears the unit costs were lower - possibly representing add-ons to existing equipment systems. States put up somewhat more money toward total costs (3%).

The number of employees supported by Federal funds decreased, but here States seem to have provided lesser amounts of match money. This picture changes considerably in the training area. Although the relative cost is small - compared to total Federal funds for TRS - States are picking up training costs to a large degree.

EMERGENCY MEDICAL SERVICES

Introduction

The Emergency Medical Services standard broadly outlines the elements required in that part of a State's highway safety program. The purpose of the standard is to improve the lifesaving capability of emergency medical services through personnel training, proper equipment, communications, operational coordination and comprehensive planning at both the State and local levels.

This paper will assess some of the effects of Federal and State/local efforts in Emergency Medical Services. The assessment looks at three major aspects of EMS.

- What the $35 million in Federal grant EMS funds and the $20 million State and local share bought. A large portion of the total (37%) went for 2200 ambulances.

- National trends in EMS. This section looks at State EMS activity regardless of funding source and summarizes Statewide data to determine national trends.

- The role of Federal funds in contributing major trends in EMS nationally. Catalytic effects include the creation of new activities in the EMS planning area and certain areas where States have picked up funding on efforts initiated with Federal funds.

Overview of Federal Grant Aided Purchases

This section contains three tabulations of EMS expenditures from 1968 to 1973.

1. The amount and percentage of Federal grant funds spent on particular items.
2. The number and average cost of items purchased.
3. A comparison of the Federal vs. the State/local share for individual items.

Table 1 is a listing of items in descending order of Federal funding share amounts - it accounts for 90 percent of what was bought with the aid of grant money.

Table 1

Federal Grant (Sec. 402) Expenditures for Emergency Medical Services by item (FY 1968 - FY 1973)

Description of Items	Cumulative Federal Expenditures FY 68 - FY 73 ($ thousands)	% of Total 1/
Ambulances	12,940	37.0
EMS Administrative Staff	3,250	9.3
DOT Emergency Medical Technician (EMT) Course	2,810	8.0
State/community communications systems and Base Stations	2,690	7.7
EMS Surveys and Plans	2,180	6.2
Ambulance 2-way Radios	1,780	5.1
Medical Treatment Equipment	1,620	4.6
Ambulance Attendants (salaries)	1,600	4.6
Private Ambulance Subsidies	1,580	4.5
EMS Instructor Training	660	1.9
EMS Coordinators (salaries)	590	1.7
EMT Course - pre DOT	570	1.6
	32,270	

By far the largest share of EMS expenditures in every year has gone to purchase ambulances. The top 6 items account for 77% of total Federal expenditures, and the top 10 items account for 89%.

From 1968 to 1973 94 percent of the funds (Federal plus State/local matching share) under the EMS standard bought the following items at the average cost indicated.

1/ percent of total Federal grant funds for EMS ($35 million)

- 2200 ambulances
  Average cost - $10,600 per ambulance

- 350 salaries of State EMS administrative staff workers - a total of 85,000 man days of service
  Average yearly cost - $11,800 per employee

- 2400 DOT - Emergency Medical Technician courses for 53,400 people
  Average cost - $63 per man trained

- 300 pre-DOT Emergency Medical Technician courses for 27,600 people
  Average cost - $22 per man trained

- 60 EMS surveys, plans and evaluations
  Average cost - $46,000 per plan

- 800 State/community communications systems and base sections
  Average cost - $5700 per system

- 2500 2-way radios for ambulances
  Average cost - $1,100 per radio

- 1000 lots of medical treatment equipment (rescusitators, defibrilators, etc.)
  Average cost - $2,800 per lot

- 1150 yearly salaries of ambulance attendants - 177,000 man days of service
  Average yearly cost - $2,300 per attendant

- 30 subsidies to private ambulance services
  Average cost - $114,000 per subsidy

- 100 EMS instructor training courses for 2,600 instructors
  Average total cost - $250 per instructor

- 50 salaries of State EMS coordinators - a total of 14,000 man days
  Average yearly cost - $17,600 per coordinator

- Salaries of 23 Emergency Medical Technician Instructors
  Average yearly cost - $10,000 per instructor

- 40 EMS extrication courses training a total of 1300 people
  Average cost - $15 per pupil trained

The State Money Match

Figure 1 compares cumulative Federal grant dollars to cumulative total dollars (Federal plus the State and local matching share) spent to upgrade EMS systems. Since the cumulative trends diverge, the Federal portion of total cost (actual cost) has decreased and the States' share increased over the years. Overall, the EMS State and local matching share is 37 percent

An item-by-item listing, showing the Federal and State portions of actual (total) cost is presented in Table 2, and some highlights are discussed in the following paragraphs.

Figure 1

Cumulative Actual and Federal Costs

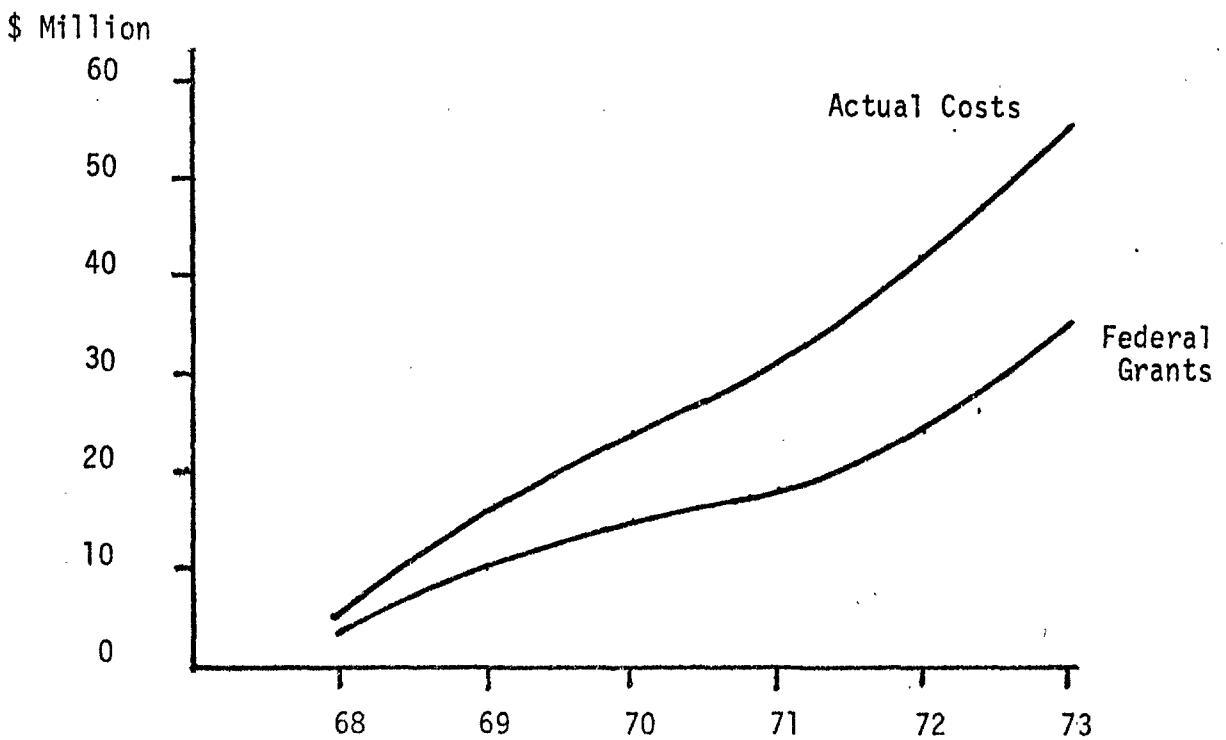


Table 2

Purchases Funded in Part or in Total
through Federal Grants for EMS, FY 1968 - FY 73

Description	A Federal Cost ($1,000s)	B State/ local ($1,000s)	C=A+B Actual Cost ($1,000s)	A-C Federal Percent of Total	C-A "Hard Match" Ratio
Ambulances	12,938	10,562	23,500	55.1	1.8
EMS Administrative staff /	3,251	899	4,150	96.5	1.3
DOT EMT courses	2,807	561	3,368	83.3	1.2
State/city Communications Systems and Base Stations	2,687	1,847	4,534	59.3	1.7
EMS Surveys and plans	2,180	508	2,688	81.1	1.2
Ambulance 2-way Radios	1,783	1,025	2,808	63.5	1.6
Medical Treatment Equipment	1,617	1,227	2,844	56.9	1.8
Ambulance Attendants	1,599	1,071	2,670	59.9	1.7
Private Ambulance subsidies	1,575	1,744	3.319	47.5	2.1
EMS Instructor training Courses	665		665	100.0	1.0
EMS Coordinators	591	287	878	67.3	1.5
EMT Courses - Pre DOT	566	65	631	89.7	1.1

Ambulances. One reason for the relatively high State/local share toward ambulance purchases is an upper limit of $10,000 NHTSA will pay. Over six years, therefore, the hard match ratio has averaged about 1.8. In other words, for every Federal dollar, States or communities put up 80 cents.

Medical Treatment Equipment has averaged a hard match ratio of 1.8. In other words the State and localities put up about 80 cents for every Federal dollar spent on medical treatment equipment. The hard match ratio is also high for State/city communications systems and base stations at 1.7, and for 2-way radios at 1.6.

Private Ambulance Subsidies. The high hard match ratio for this item is somewhat misleading. Only 12 States ever subsidized private ambulance services and the high hard match ratio is due primarily to large subsidies by Florida and Utah in 1968 and 1969. In general the practice has ceased and there were only 2 subsidies in 1972 and 4 in 1973. States found that they could get more political and highway safety mileage out of their Federal grant dollars by purchasing new ambulances for localities that didn't have them instead of subsidizing existing ambulance services.

In general, the hard match ratio was higher for equipment. States and localities were much more likely to put up their own money for something tangible. Hard match ratios for salaries and training were typically lower. Ambulance attendants salaries, with a hard match ratio of 1.7 are an exception to this rule, perhaps because the attendants can be directly associated with the ambulance.

Concentration of Purchases

The following are highlights of the States that did or did not buy particular items with Federal funds from FY 1968 to FY 1973:

- 48 States bought ambulances; Idaho, Hawaii, Louisiana and Texas bought none and California, Connecticut and the District of Columbia bought one each.
- 37 States purchased 2-way radios for ambulances.
- 38 States purchased State/city communications systems and base stations.
- 37 States purchased medical treatment equipment for ambulances
- 34 States used Federal funds to hold DOT Emergency Medical Technician training courses.
- 29 States paid salaries of EMS administrative staffs.
- Only 12 States gave subsidies to private ambulance services.
- Only 7 States used Federal funds to hold EMS instructor training courses.
- Only 2 States, Indiana and Iowa used Federal funds for extrication courses

National Trends in EMS

The Statewide data presented here was obtained from EMS surveys paid for with Federal grant and State/local matching funds. The following data items are available for each of the 50 States and the District of Columbia for 1967, 1969, 1971, 1972, and 1973:

- Total number of ambulance services
- Total number of ambulances
- Percent of ambulances meeting the American College of Surgeons Essential Equipment list
- Percent of ambulances with two-way radios
- Total number of ambulance personnel
- Percent of ambulance personnel with advanced Red Cross training or better.

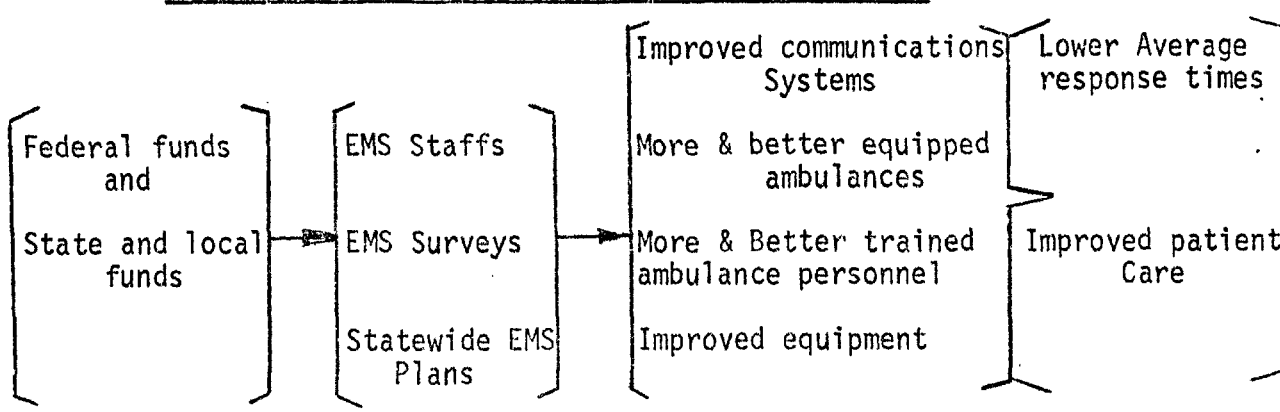
In 1972 and 1973 data for the number of ambulance personnel with the NHTSA 81 hour Emergency Medical Technician course or equivalent were also available.

In 1967 only 26 States had completed EMS surveys. Therefore, the data presented here for some States are NHTSA's best estimate based on comparisons with the neighboring States known to have similar EMS patterns. By 1972 all States had completed EMS surveys and much less estimation was required.

Development Scenario

A hypothetical scenario for the development of Emergency Medical Services in a State might be pictured like this.

Scenario for the Development of an EMS Program



Federal funds and matching State and local funds in this scenario are initially concentrated on surveys, plans and staffing (In fact this was the case; 20% of Federal funds for EMS in 1968 were spent on surveys and plans, 14% were spent on State EMS staffs).

A survey inventories EMS resources while a plan identifies needs and specifies how they should be met. Typically, the major needs in EMS might be: improved communications systems, more and better equipped ambulances, more and better trained ambulance personnel, and improved equipment.

These improvements would lead to better EMS coverage as measured by a lower average response time and to improved care of patients.

The data generally show that the nationwide scenario has proceeded along these lines. The major data gap is in the last areas,- the measurable output. Urban and rural response times are rarely available and then not comparable. Measures of improved care are similarly lacking.

National Trends in EMS

A summary of Statewide data show the following major national trends in EMS since 1967.

- A recent trend towards fewer ambulance services (5% decrease between 1972 and 1973)
- A 15% increase in the number of ambulances (22,460 in 1967 compared to 25,800 in 1973)
- A trend towards better equipped ambulances (the percentage of ambulances with 2-way radios jumped from 46% in 1967 to 65% in 1973)
- A 24.6% increase in the number of ambulance personnel
- An improvement in the training qualifications of ambulance personnel. (The percentage of ambulance personnel with Red Cross, or better, training went from 52% in 1967 to 70% in 1973).
- The establishment of State organizations responsible for statewide EMS coordination and planning. (In 1966 only two States had a full-time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have full-time EMS staffs.)

Number of Ambulance Services. There has been a recent decrease in the number of ambulance services. Between 1972 and 1973 the total number of ambulance services decreased from 14,780 to 14,030, a drop of 5.1%.

Number of Ambulance Services
- 50 States & D.C. -

Year	
1967	13,260
1969	13,260
1971	14,490
1972	14,780
1973	14,033

This decrease is largely explained by funeral homes with one or two vehicles dropping out of the ambulance business because it didn't pay off financially. The situation was made more acute by the enactment of the Fair Labor Standards Act and Medicare. The absolute decrease would probably be larger if the slack in service had not been taken up by increased commercial, municipal and volunteer services. A 1971 HEW survey of ambulance ownership in 37 States showed the following distribution:

Funeral homes - 44%
Commerical Firms - 14%
Fire, Police, Civil Defense or City/County operated - 13%
Volunteer fire, police or independent - 24%
Hospital operated - 3%
Other and unspecified - 2%

NHTSA currently estimates that the percentage for funeral homes is now between 30-35%.

Number of Ambulances. The trend toward a smaller number of ambulance services has been accompanied by an increase in the total number of ambulances.

Number of Ambulances
-50 States & D.C.. -

1967	22,460
1969	22,460
1971	24,800
1972	24,470
1973	25,800

While there was a slight drop in 1972, the increase since 1967 is close to 15 percent. The general configuration of new ambulances has improved. The trend has been away from mere transportation of accident victims toward four patient care.

Ambulances per Service. Calculations show that the average number of ambulances per service has increased from 1.69 in 1967 to 1.84 in 1973. This increase indicates improved capacity to respond to multiple calls and may be an indicator of upgraded service.

Ambulance per Service
-50 States & D.C. -

1967	1969	1971	1972	1973
1.69	1.69	1.71	1.66	1.84

Ambulance Equipment. There is also a considerable body of evidence that indicates that the average ambulance has become better equipped. The following table shows the percentage of vehicles meeting the American College of Surgeons essential equipment list and the percentage of vehicles with two-way radios from 1967 to 1973.

Trends in Ambulance Equipment
-50 States & D.C.-

	1967	1969	1971	1972	1973
% Vehicles meeting A.C.S.* essential equipment requirements	43	43	39	51	53
% Vehicles with 2-way radios	46	46	47	61	65

These increasing percentages are significant because they occurred in the face of an increase in the total number of ambulances.

Ambulance Personnel. The most notable trend in EMS nationally has been the increase in the number of EMS personnel.

Number of Ambulance Personnel
- 50 States & D.C. -
(thousands)

1967	166.0
1969	160.0
1971	147.0
1972	202.1
1973	206.8

* American College of Surgeons

The drop in ambulance personnel in 1971 is actually due to overestimation in 1967 and 1969. Yet, the total increase since 1967 amounts to 24 percent. By 1971 more EMS surveys were in, and previous estimates were found to be inflated.

The number of personnel per service and the number of personnel per ambulance have also increased moderately, as the following table shows:

Personnel per Service and Personnel per Ambulance
-50 States & D.C. -

	1967	1969	1971	1972	1973
Personnel per service	12.5	12.5	10.1	13.7	14.7
Personnel per ambulance	7.4	7.4	5.9	8.3	8.0

Training of Ambulance Personnel. The increased number of ambulance personnel are also significantly better trained. The following table shows the percent of personnel with advanced Red Cross or better training.

Ambulance Personnel Trained
- 50 States & D.C. -

	1967	1969	1971	1972	1973
% Red Cross or better training	52	52	47	68	70

There has also been considerable training of ambulance personnel using DOT prepared training material. This training will be discussed later in this paper.

Statewide EMS Administrative Staff. In 1966 only two States had a full-time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have full-time EMS staffs. In 1966 no State had a comprehensive EMS plan but by the close of 1973 all States will have comprehensive plans. Such administrative staffs and plans are vital in planning, implementing and evaluating the allocation of EMS resources.

In the next part of this paper the effects of Federal grant aid on State and local programs will be discussed.

Use of Federal Funds and Catalytic Effects

This part will examine a variety of catalytic effects, including the following:

- Creation of new activities.
- Areas where the States have picked up the funding on an effort initiated with Federal funds.
- The role of Federal funds in improving ambulance configuration.
- The role of Federal funds in training personnel in Emergency Medical Care.

Creation of New Activities with Federal Grant Aid

EMS Surveys and Plans. Through FY 1973 about $2.7 million in Federal funds or 7 percent of total had been spent on EMS surveys and plans. In 1968 20% of Federal EMS funds were spent on EMS surveys and plans.

All 50 States, D.C. and Puerto Rico have had EMS surveys and plans. Federal funds helped to pay for 55 surveys and plans in 31 States.

An EMS survey is basically an inventory of EMS resources. Before 1967 such surveys did not exist. These surveys are important because States generally had no clear picture of the EMS universe (i.e., coverage, resources and needs). The initial surveys helped to provide this vital information. The surveys provided almost all of the data used to analyze National EMS trends in the last section of this paper.

A comprehensive EMS plan is a detailed implementation document to satisfy the needs that might be identified by an EMS survey. An EMS plan plots a rational course for statewide improvement.

EMS Administrative Staffs. Another new activity involves the administration of State EMS programs. Through June 1973 a total of about $3.8 million has been spent to pay the salaries of EMS coordinators and administrative staff.

These funds can in no way be viewed as operational subsidies because such staffs generally didn't exist before 1967. In 1966 only 2 States had a full-time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have full-time EMS staffs. Federal funds have helped to pay EMS staff salaries in 35 of these States. Clearly the primary push has come from the Federal grant program.

	Conventional, Custom, Coach or Limousine Type Ambulance	Hearse or Hearse Ambulance	Station Wagon	Panel Truck, Carryall, Travellall, or Van	Rescue Type Vehicles, or other
1971	37%	21%	24%	10%	9%
1973	25%	15%	10%	35%	15%

The 1973 figures are NHTSA's estimate. The percentages have decreased for those types of vehicles (limousines, hearses and station wagons) that tend to lack sufficient headroom for proper patient care. The major increase has been in a configuration that allows four patient care.

Federal requirements have been the major cause of this trend. Since 1968 a raised roof with 54 to 60 inches of headroom was required for an emergency vehicle to be eligible for Federal funding. In 1973 all Federally funded emergency vehicles had to meet the DOT ambulance design criteria which specify a design suitable to four patient care. Currently all major ambulance manufacturers but one produce only vehicles that conform to the DOT ambulance design criteria.

Training Personnel in Emergency Medical Care. Perhaps the most significant advances in Emergency Medical Services since 1967 have been in the development of career status for ambulance personnel through training. 27,601 people have been trained in the pre-DOT course and 53,561 people have been trained in the 81 hour DOT-Basic Training Course for Emergency Medical Technicians. 45 States and the D.C. have adopted the 81 hour course as standard for ambulance personnel. The remaining 5 States and Puerto Rico are using an equivalent course or plan to use the 81 hour course. Because of the massive training activities projected in the FY 1974 annual work programs, it is projected that 80% of the ambulance personnel will be trained at this level by January 1975.

Areas Where the States Have Picked Up Funding

EMS Surveys and Plans. Since all States, the District of Columbia and Puerto Rico have had at least one survey and since all States, will have a comprehensive EMS plan by the end of 1973, it can be estimated that there have been a total of 104 EMS surveys and plans. Federal funds have paid for a total of 55 surveys and plans. The remainder (49) were apparently fully funded by the States.

State EMS Staffs. In 1966 only 2 States had a full-time EMS staff. Today all 50 States, Puerto Rico and the District of Columbia have such staffs. In 1973 Federal funds helped to pay for the salaries of EMS staffs in only 20 States. In other words 32 States had picked up the funding of State EMS personnel.

Ambulance two-way radios. The following table shows the number of ambulances with 2-way radios and the cumulative number of 2-way radios purchased with Federal funds. Two-way radios are important for dispatching but also for emergency vehicle - hospital communications on patient condition and immediate medical needs.

Total Ambulances with 2-way Radios and Federally Funded 2-way Radios

	# Ambulances w/2-way radios (nationwide)	Increase from Prior Year	Cum. No. Federally Funded 2-way Radios	Increase fm Prior Year	% Federally Funded of Total
1969	10,300		446		
1971	11,700	1,400	1,453	1007	76%
1972	14,900	3,200	2,078	625	20%
1973	16,700	1,800	2,453	375	21%

The Federally aided portion of the increase in units has declined considerably over the past two years.

Ambulance Configuration. Since 1968 there has been a general trend in ambulance configuration away from a design providing for mere transportation of accident victims and towards a configuration designed to enhance patient care. The following table taken from a 1971 HEW survey shows the distribution of the type of emergency vehicles in 28 States:

Cumulative No. Trained in EMT Courses
- 50 States & D.C. -

	1968	1970	1971	1972	1973
Pre DOT-EMT course	7,300	12,300	14,400	15,300	27,400
DOT 81 hour course	10,000	10,900	13,900	18,000	53,600
No. ambulance EMS instructors	1,200	1,200	1,200	1,250	2,600
No. Ambulance personnel		166,000	147,100	202,100	206,900

In addition to the basic 81-hour course, a 480-hour advanced training course for Emergency Medical Technicians has been developed and is currently being pilot tested in selected States. A refresher course is available and is used in conjunction with the 81-hour course as well as other training. An extrication course for ambulance personnel is being printed as is a crash injury management course for Traffic Law Enforcement Officers.

POLICE TRAFFIC SERVICES

The Objectives of the Standard and Scope of Assessment

Objective. The purpose of Police Traffic Services (PTS), is to control traffic to facilitate the safe and expeditious movement of people and goods. Indirectly one could say that PTS could help to reduce the number and adverse consequences of traffic collisions.

The Police Traffic Services Standard refers to the following objectives and conditions of a State PTS program:

- Uniform training procedures
- Suitable in-service training courses
- Procedures to allocate police resources to facilitate traffic flow
- Procedures for selective assignment of police
- A continuing enforcement program
- Procedures for accident reporting
- Methods for recognizing and reporting hazardous conditions
- Appropriate agreements within the State regarding authority and responsibility

Scope. This assessment will cover what Federal funds helped buy in the Police Traffic Services Standard area. The State-wide programs reflecting the work of the vast number of State and local police organizations nationwide - as they relate to highway safety - are difficult to quantify since very few data are available. Further on, some analysis of catalytic effects - the impact or influence of Federal funding use-will be presented.

Generally, States used Federal funds to pay for vehicles and police manhours, for equipment such as speed detectors and radios, to aid in construction of police academy buildings, to fund local selective enforcement projects, surveys and studies, and for training of police officers. Over $63 million in Federal funds was used from 1968 through 1973. In FY 1973, 23.6 percent of all Federal funds were devoted to PTS.

The State programs, when viewed nationwide, included many diverse projects. For example, speed measuring devices were used to control traffic and subsequently to change behavior, especially in rural areas of some States. Other projects consisted of mounting video cameras on patrol cars to monitor traffic and to have violators view themselves at the scene of the traffic offense. Many projects included the use of police officers on overtime with assignments to high fatal crash locations. Many States have adopted this concept of selective enforcement.

An Overview of Federal Grant Assisted Purchases

The three tables shown in this section are intended to highlight purchases by the 50 States, the District of Columbia and Puerto Rico, aggregated over the period FY 1968 to FY 1973.

Summary of Items Bought (Table PTS-1). The table shows eight item categories which, in total , represent all purchases in which Federal funds (Sec. 402) where used in part or in total.

Over $58 million, or 92 percent of all Federal funds, were spent on equipment, training, personnel salaries, vehicles and special projects (local selective enforcement). The breakdown looks like this:

	Federal Cost	% of Total Federal Cost
° Equipment	$ 17.0	26.8
° Training	11.8	18.6
° Personnel Salaries	11.6	18.3
° Vehicles & Aircraft	10.5	16.5
° Special Projects	7.5	11.8
	$ 58.4	92.0

SUMMARY OF PURCHASES FUNDED IN PART
OR TOTAL THRU FEDERAL GRANTS FOR
POLICE TRAFFIC SERVICES

FY 68 - FY 73
($000,000)

Items	Quantity	Federal Cost	State/Local Match	Actual Cost	% Fed. of Actual	"Hard Match" Ratio
Vehicles	1,707	10.5	3.1	13.6	.77	1.30
Personnel	1940/468,900 1/	11.6	4.8	16.4	.71	1.42
Equipment	16,940	17.0	3.8	20.8	.82	1.22
Construction	10	2.0	1.2	3.2	.63	1.60
Special Projects	76	7.5	1.7	9.2	.81	1.23
Training	50,900 2/	11.8	4.4	16.2	.73	1.37
Surveys/Studies	40	1.1	.1	1.2	.94	1.06
Operating Costs		2.0	.2	2.2	.93	1.08
Total PTS		$63.5	$19.3	$82.8	.77	1.30

1/ Number of Persons/Mandays

2/ Number of Persons Trained

TABLE PTS-1

Looking at the "hard match ratio" column, or conversely at the percent of Federal funds which were part of the actual cost, it can be seen that the Federal portion accounted for between 71 and 82 percent of actual cost for the five largest (dollar)categories.

Equipment and vehicles will be presented in more detail in the next two sections. Personnel salaries and the over 430,000 mandays of police officers time could not be broken down between additional personnel and overtime. Georgia, Kansas, Missouri and New Jersey account for over 40 percent of the mandays of police officer time.

Most of the training money was spent for specific traffic training courses, although slightly over 400 people were trained to use breath testing devices. A small number of pilots (18) were trained with the aid of Federal funds - as part of earlier helicopter and aircraft traffic control projects.

Special projects are primarily composed of one or more specific countermeasures grouped under the heading of selective enforcement. There were 71 such projects.

Equipment. All told, there were 24 different item types bought in part with Federal funds ranging from speed detection devices (7,161) to stationary breath testing devices (5). Table PTS-2 summarizes the major items.

Federal fund portions of actual cost ranged from 60 percent (communications control centers and radios) to 100 percent (the breath testing devices above). For equipment in the aggregate, for every Federal dollar, twenty two cents was matched in cash by States.

Speed detection and communications equipment account for $11.2 million, or almost 18 percent of the Federal funds spent in Police Traffic Services over a six-year period.

Vehicles and Aircraft. Police cars (1,079) and motorcycles (465) lead the list as shown in Table PTS-3. In terms of total costs, however, the high priced items are helicopters and fixed-wing aircraft ($6.2 million). While this is covered later on, it should be pointed out here that most of the helicopters and aircraft purchased - with Federal funds - occurred in the earlier part of the programs. It is also not known whether these were all outright buys or leases since the individual costs in the data banks differ considerably; some are definitely too low to be actual purchase cost.

SUMMARY OF EQUIPMENT PURCHASED IN PART
OR TOTAL THRU FEDERAL GRANTS FOR
POLICE TRAFFIC SERVICES

FY 68 - FY 73
($ 000,000)

Items	Quantity	Federal Cost	State/Local Match	Actual Cost	% Fed. of Actual	"Hard Match" Ratio
Speed Detectors	7,161	6.2	1.4	7.6	.81	1.23
Vidio Tape Units	791	1.0	.2	1.2	.84	1.20
Walkie Talkies	1,143	.7	.2	.9	.79	1.26
Radios	2,114	1.3	.9	2.2	.60	1.66
Communication Base Station	288	1.3	.3	1.6	.70	1.27
Police Assistance Equipment	3,340	1.5	.2	1.7	.91	1.10
Communication Ctl. Ctr.	104	.4	.2	.6	.60	1.68
State/City Communication Systems	22	1.3	.1	1.4	.93	1.08
Breath Test Device-Port.	127	.2	0	.2	.96	1.04
Breath Test Device-Sta.	5	0	0	0	1.00	1.00
Other Equipment	1,850	3.1	.3	3.4	.93	1.08
Total Equipment	16,945	$ 17.0	$3.8	$20.8	.82	1.22

TABLE PTS-2

SUMMARY OF VEHICLES PURCHASED IN PART
OR TOTAL THRU FEDERAL GRANTS FOR
POLICE TRAFFIC SERVICES

FY 68 - FY 73
($ 000,000)

Items	Quantity	Federal Cost	State/Local Match	Actual Cost	% Fed. of Actual	"Hard Match" Ratio
Police Cars	1,079	2.8	.8	3.6	.79	1.27
Motorcycles	465	.8	.1	.9	.86	1.16
Helicoptors	50	5.9	2.0	7.9	.75	1.34
Fixed Wing Aircraft	12	.3	.2	.5	.63	1.60
Other Vehicles	101	.6	.1	.7	.89	1.12
Total Vehicles	1,717	10.4	3.2	13.6	.77	1.30

TABLE PTS-3

The Statewide Police Traffic Services Program

Availability and Quality of State Data. State-wide data for Police Traffic Services are hard to get. Information as to what the makeup of local police departments is and what they do is not collected on a national basis. What we have collected consists of the number of police officers, and police organizations in the U.S. We also have data on state police and highway patrols including: number of employees, police officers, police cars, percent of manhours devoted to traffic services, recruit training hours, annual budgets, and miles patrolled per officer. Citations are available, in part, for only one year (1971).

The highway patrol and state police represent about 11% of the police officers in the U.S. and less than one percent of the police agencies. To generalize, or extrapolate nationally the characteristics and effects of state police would be difficult and somewhat inaccurate. State police forces work under different authorities and conditions so that, for example, the percentage of time spent on highway traffic by state police cannot be assumed to be the same for local (city, county) police departments. One important factor is the emphasis on crime prevention in recent years - a significant program for city police and one which has received wide Federal attention particularly with grants from the Law Enforcement Assistance Administration.

Police Traffic Services Description, Limitation, Innovations

Most police agencies, at least below State level, have a dual responsibility: crime prevention and traffic services. Many large police agencies have a patrol division for crime and a traffic division. Traffic services include traffic direction and control, accident investigation and traffic law enforcement.

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In recent years, there has been a definite decrease in the size and number of traffic divisions because of the emphasis on crime. There has, therefore, been a need to use innovative techniques to better utilize the limited resources available for traffic services. One of these is the widespreaduse of speed detection devices, which are inexpensive, portable and accurate. Even the smallest police agency can afford them.

Another device is the video tape unit mounted on top of patrol cars to monitor traffic. Once a violator is apprehended, he is invited to sit in the patrol car and view himself committing the traffic offense.

Selective enforcement techniques concentrate personnel at times and locations where high accident frequencies exist.

There are limits to just how much police traffic services can do by itself. Issuing a large number of citations can result in overloading traffic courts, lowering conviction rates (discouraging officers from issuing more citations), or increasing work caused by more revoked or suspended licenses.

Assessments of the research and demonstration projects so far have shown that selective traffic surveillance appears to result in fewer personal injury accidents. One of the major problems in attempting to determine the usefulness of most of the innovative techniques is the inadequacy of the experimental designs.

Police Forces - Nationwide

The three tables on the following pages are a compilation of the national data available. They show the magnitude of enforcement resources nationwide (Tables 4 and 5) and at the State level (Table 6). Some of the key enforcement resources shown are:

- 374,000 police officers (1973) - representing 5921 cities, 2559 sheriffs agencies and 49 state police and highway patrols.
- 57,900 officers (1972) in 49 state police and highway patrols.

POLICE FORCES - NATIONWIDE
WITH NATIONAL DATA ON POPULATION,
REGISTERED VEHICLES, ROAD MILES, AND
VEHICLE MILES 1/

Year	Officers (000's)	Population (000,000's)	Reg. Vehicles (000,000's)	Road Miles (000,000's)	Vehicle Miles (000,000,000's)
1968	333	200	103.1	3.68	1,016
1969	349	202	107.4	3.71	1,071
1970	365	203	111.2	3.73	1,120
1971	373	209	116.3	3.76	1,186
1972	374	210	112.4	3.80	1,250

1/ Includes 5,921 cities, 2559 sheriffs agencies, 49 state police or highway patrol

Table PTS-4

AVERAGE NUMBER OF POLICE
OFFICERS BY CITY SIZE

Year	Population: Over 250,000	100 - 250,000	50 - 100,000	25 - 50,000	10 - 25,000	Under 10,000	County Sheriff's Departments
1968	2,028	226	97	49	22	8	24
1969	2,041	234	101	50	23	8	32
1970	2,133	254	106	52	24	8	32
1971	2,148	257	109	54	25	8	31
1972	2,159	262	110	55	24	8	25

Table PTS-5

STATE POLICE AND HIGHWAY PATROL

Year	Officers (ooo's)	Vehicles (ooo's)	Miles Patrolled/Officers
1968	50.6	27.3 (Est.)	13.0
1969	52.8	28.4	12.3
1970	54.8	30.0	11.4
1971	57.1	31.2 (Est.)	11.2
1972	57.9	32.3	11.0

Table PTS-6

Use of Federal Funds and Catalytic Effects

The thrust of the analysis is to determine where and how Federal funds were used to enhance police traffic services. Federal grants of $32.4 million for 1968-1970 and $31.0 million for 1971-1973 were spent for police traffic services. While this was a decrease in total dollars, helicopters accounted for $5.5 million in the 1968-70 period, but only $400 thousand between 1971 and 1973. Removing the helicopter expenditures in both periods yields $26.0 million and $30.6 million, respectively, or an increase in funding of 13 percent.

Estimate of Police Traffic Services Manpower

The percentage of state police manhours devoted to traffic services ranged from 30 to 82 percent in 1968, and from 16 to 75 percent in 1971. (Note: In 1971 only one State showed 16 percent. The next highest was 31 percent.) Applying the above minimum of 30 percent to total number of police officers nationwide in 1968 (333,000) one could estimate that approximately 100,000 officers would have been available for traffic services in 1968.

We were interested in seeing the growth in traffic services officers from 1968 to 1972, and whether this growth kept pace with other factors. Based on the growth of population, registered vehicles, and vehicle mileage, police traffic services manpower should have increased a total of 3% from 1968 to 1972, all things being equal. There are, however, many factors which suggest that this 3 percent minimum is somewhat understated:

- highway speeds increase .4 mph annually
- alcohol consumption increases 2 percent each year
- more young drivers and more night and weekend driving

The total nationwide police force, including officers for crime prevention and traffic services increased a total of 12 percent from 1968 to 1972. It would appear that the growth of traffic service manpower should have been between 3 percent and 12 percent.

Due to the inaccessability of data on the actual size of the traffic services portion of police nationwide, we are unable to pinpoint exactly what growth has occurred. In other words, we can only estimate whether actual growth has kept pace with the three-to-twelve percent requirements range shown above.

There are several reasons for believing, however, that actual growth falls closer to three percent than to twelve percent:

- The emphasis in police growth in recent years has been in the field of crime prevention. The formation of LEAA has been a prime means of Federal money for this activity.

- The number of police traffic services divisions had declined across the country.
- Police have turned to more equipment-intensive surveillance, for example in the use of radar and video-tape units. This in turn would permit fewer officers to oversee more major stretches of roadway than in the past.

Changes in Purchase of PTS Items

To better understand how the Federal funds were used, changes in the purchase of major categories of items were analyzed.

Police Vehicles. These were the major changes between the first and second 3 years of the grant program:

	1968-70	1971-73	% Change
Number of vehicles	794	866	+ 8.7
Federal $ (Millions)	1.8	2.8	+ 55.6
Hard Match Ratio	1.28	1.22	- 4.7

* excludes 50 helicopters - Federal cost of $5.9 million

The Federal portion of the cost per vehicle increased between 1971 and 1973, and the hard match ratio decreased. This meant that proportionately more Federal funds are being used by the States to buy vehicles and that the unit cost per vehicle increased.

Personnel. Most of the Federal funds were spent to employ new police officers and to pay overtime of existing officers:

	1968-70	1971-73	% Change
No. of Mandays (thousands)	237	231	- 2.5
Federal $ (millions)	6.3	5.3	- 15.9
Hard Match Ratio	1.49	1.33	- 10.7

It appears the cost per officer decreased in 1971 - 1973. This perhaps reflects salaries of newer, less experienced personnel, and additional officers, rather than more overtime for the existing force.

Training. Data, primarily for traffic service courses, are as follows:

	1968-70	1971-73	% Change
No.of people trained (thousands)	27.4	23.5	- 14.2
Federal $ (millions)	5.3	6.5	+ 18.5
Hard Match Ratio	1.36	1.38	+ 1.0

Fewer people were trained in 1971-73 but with more Federal funds. Since the hard match ratio did not change, the total training cost probably increased as well. The average length of time for traffic service courses has been increasing. This type of upgrading in training could account for the increase in training cost per officer and would be consistant with the apparant increase of new officers (recruits) previously discussed.

Equipment. In terms of money, this was the largest category and consisted of 24 different types of items. The most significant four consumed 70% of the Federal funds spent on equipment, as shown below:

	1968-70	1971-73	% Change
No. of Speed Detectors (thousands)	3.8	3.3	- 12.7
Federal $ (millions)	3.0	3.2	+ 6.7
Hard Match Ratio	1.26	1.20	- 4.8
No. of Video Tape Units	321	470	+ 49.5
Federal $ (millions)	.5	.5	0
Hard Match Ratio	1.23	1.10	- 10.6
Communication (thousands)	2.0	1.6	- 23.3
Federal $ (millions)	2.9	2.1	- 27.6
Hard Match Ratio	1.15	1.07	- 7.0
Police Assistance Equipment (thousands)	.7	2.6	+282.0
Federal $ (millions)	.5	1.0	+100.0
Hard Match Ratio	1.15	1.07	- 7.0

* Includes radios, walkie-talkies, base stations, control centers, and systems.
** Includes extractor bars, blankets, manuals, etc.

Police agencies are using more sophisticated equipment such as video tape units to provide better enforcement and legal evidence. Also the recent increase in police assistance equipment suggests an upgrading of police agencies. The decreases in hard match ratios indicate that the States have been contributing less of their funds to provide these improvements.

Traffic Enforcement - Shifts in Emphasis

Local selective enforcement projects were compared with the major categories of Federal funded items, as shown below:

	1968-70	1971-73	% Change
Vehicles $(millions) (excluding helicopters)	1.8	2.8	+ 55.6
Personnel $ (millions)	6.3	5.3	- 15.9
Training $ (millions)	5.3	6.5	+ 18.5
Equipment $ (millions)	7.8	9.2	+ 18.0
Total	21.2	23.8	+ 12.3
No. of Selective Enforcement Projects	12	59	(5 fold)
Federal Funds	2.0	4.4	+ 120
Hard Match Ratio	1.02	1.37	+ 34.3

The percent increase in Federal funds is considerably greater for selective enforcement than the increase in funding for the other major categories. Also the States put a larger portion of their own funds into selective enforcement as seen by the increase in the hard match ratio. This would suggest that the States are shifting emphasis to selective enforcement. The increase in selective enforcement projects have occurred mostly in 1973, with 48 project starts; 13 in California, 23 in Louisiana and 12 spread out among as many States. Eight of the Louisiana projects are alcohol related (DWI patrols). In addition, there were undoubtedly other local selective enforcement projects that were not reported. For example, Michigan has 23 such projects which were placed in our data system in their individual cost categories.