

AN EVALUATION OF THE INCREASE IN TRAFFIC FATALITIES
IN VIRGINIA IN 1977

by

Deborah Mitchell
Research Analyst

and

Cheryl Lynn
Research Analyst

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ABSTRACT

Since the Arab oil embargo of 1973 the number of fatal traffic accidents and fatalities in Virginia has been relatively stable from year to year. However, in September 1977 fatalities began to occur at an alarming rate and by the end of 1977, the total number of traffic fatalities had increased dramatically from that which occurred in 1976. In an effort to determine the reason(s) for this increase, fatal traffic accidents which occurred in Virginia in 1976 and 1977 were examined by using data stored in the Fatal Accident Reporting System (FARS). Demographic characteristics of the fatal accidents such as day of week, type of road, kind of location, and age and sex of driver were compared for the fatalities occurring in 1976 and 1977.

The data accessed from the FARS system were examined according to three categories: accident, vehicle/driver, and person. In the category of accident related factors, only classification of traffic-way was found to differ significantly for 1976 and 1977, with an increase in interstate and other U. S. route accidents in 1977. Vehicle related factors were similar for 1976 and 1977, except for an increase in the involvement of vehicles with lower occupancy rates in 1977. There were also some changes in the distributions of vehicle weight with the vehicles involved in fatal crashes in 1977 being slightly heavier than those in 1976. For driver related variables, there were fewer drivers involved in fatal crashes in 1977 who were considered impaired (asleep, inattentive, other driver impairment, etc.), and the 1977 drivers had been involved in fewer previous accidents and had had fewer previous traffic convictions. For persons involved in fatal accidents in 1976 and 1977, there were changes in the percentages of seat belt usage; in particular, in 1977 there was a reduction of seat belt usage among persons in the driver position. For all categories of factors there were data which were unusable due to formatting problems, insufficient information, and/or apparent coding inconsistencies in the FARS system.

SUMMARY OF FINDINGS

1. Classification of trafficway was found to differ significantly for 1976 and 1977 fatalities, with an increase in interstate and other U. S. route accidents in 1977.
2. Vehicle related factors were similar for 1976 and 1977 fatalities, except for an increase in the involvement of vehicles with one or two occupants, as opposed to three or more occupants, in 1977.
3. For vehicles involved in fatal crashes, there were some changes in the distributions of vehicle weight from 1976 to 1977. Vehicles involved in fatal crashes in 1977 appeared to be slightly heavier.
4. In 1977 there were fewer drivers who were considered impaired at the time of the accident (i.e., asleep, inattentive, other driver impairment, etc.), and in 1977 there was a smaller percentage of drivers who had been involved in previous traffic accidents or who had had previous traffic convictions.
5. Persons in the left front seat position (driver's seat) of the vehicles involved in fatal crashes showed a decrease in seat belt usage in 1977.

CONCLUSIONS AND RECOMMENDATIONS

While it was expected that one or more factors would emerge as a likely explanation for the increase in fatalities, this was not found to be the case. The statistics for 1976 and 1977 were found to differ significantly in the case of some variables, but there was no indication that a change in Virginia's highway safety program is warranted although there continues to be a need for promotion of seat belt usage.

For all of the related factors studied (accident, vehicle/driver, and person), there were data which were unusable due to formatting problems, insufficient information, and apparent coding inconsistencies. Because of these difficulties with the data output, problems encountered in accessing the FARS system, and the expense involved, it was concluded that use of the Fatal Accident Reporting System does not appear to be the best method of evaluating characteristics of Virginia traffic fatalities. State use of FARS for accident investigation is not recommended.

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INTRODUCTION

In 1974, there was, for the first time in several years, a decrease in traffic fatalities in Virginia. Traffic fatalities declined on a national level also, with nearly an 18% decrease from 1973 to 1974.⁽¹⁾ Corresponding in time to the Arab oil embargo, this decrease generally has been attributed to the oil embargo and the ensuing "energy crisis." Following the energy crisis, the number of traffic accidents and fatalities in Virginia remained relatively stable from year to year until September 1977, when the rate of Virginia traffic fatalities surged upward. By the end of 1977 there were 91 more fatalities than in 1974, 111 more than in 1975, and 121 more than in 1976 (see Figure 1).

An increase in deaths from motor vehicle accidents also occurred nationally, with the 1977 total estimated at 49,200 as compared to 46,700 in 1976.⁽²⁾ For 1977 a 5% increase in miles of travel over the figure for 1976 has been reported nationally, along with an increase of 2.5 million vehicles over the total in 1976.⁽²⁾ While traffic fatalities increased 3% nationally in 1977, they increased 9% in Virginia.

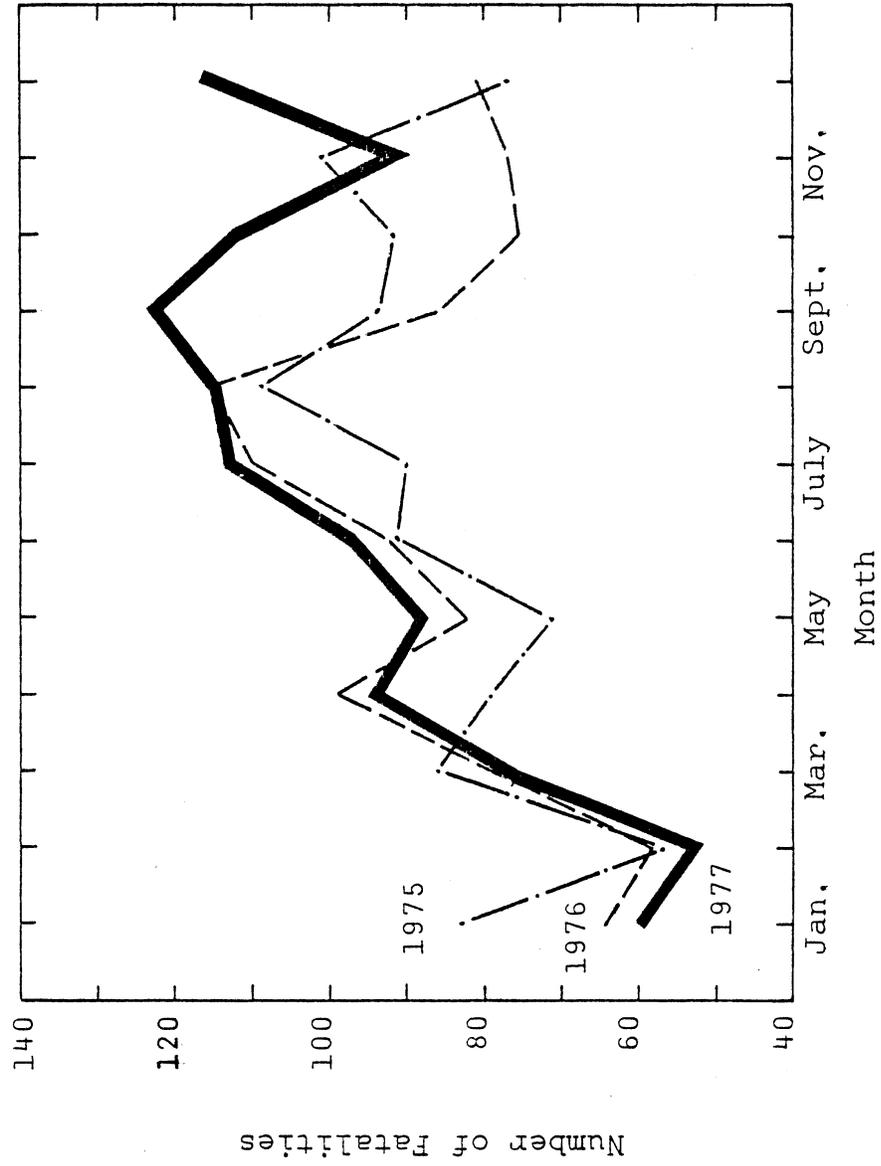


Figure 1. Traffic fatalities in Virginia during 1975, 1976, and 1977.

PRELIMINARY INVESTIGATION

In late 1977 a preliminary investigation was conducted to determine the cause or causes of the sharp increase in traffic fatalities in Virginia. FR-300 accident reports were examined for fatal traffic accidents occurring in Virginia between September 1, 1976, and October 8, 1976, and between September 1, 1977, and October 8, 1977. Ninety-five fatalities resulting from 87 accidents involving 121 drivers were studied for the weeks in 1976. One hundred sixty-one fatalities involving 137 accidents and 184 drivers were studied for the corresponding weeks in 1977. Accident related characteristics of the fatal accidents such as day of week, type of road, kind of location, and age and sex of driver were compared for the two groups of fatalities.

It was hypothesized that an increase in speed, a decrease in safety belt usage, and an increase in alcohol involvement would be responsible for the increase in fatalities during the weeks studied in 1977. No significant differences were found, however, in speed, safety belt usage, or alcohol involvement between the two groups.

Variables on which the two groups differed significantly were day of week, kind of locality, and light conditions. A significantly greater percentage of accidents occurred on weekends rather than weekdays during 1977 than during the corresponding 1976 period. Accidents occurring in areas categorized as open country increased in 1977 while accidents occurring in residential areas decreased. There was also an increase in the percentage of accidents occurring during daylight hours and in areas lighted at night during 1977.

This preliminary investigation, however, left much to be desired in the attempt to identify those factors responsible for the increase in Virginia fatalities. It did, however, indicate a need for a more timely, complete, and accurate source(s) of accident data. Because of the time lag involved in the processing of FR-300 accident report forms, it is difficult to obtain data to develop countermeasures for timely implementation. Also, incomplete information and contradictions in the data available often account for additional loss of data. There are also factors for which information is not included (or not included in sufficient detail) on the FR-300's that might be useful accident descriptors, which could possibly be obtained from other sources (medical examiner's reports, DMV records, etc.). Some of these factors might include size and weight of the vehicle involved and previous driving record of the driver involved.

For these reasons it was determined that another, more in-depth investigation of the increase in Virginia traffic fatalities was in order. The Fatal Accident Reporting System (FARS), a computerized

data base, was chosen as a data source because it was believed that it could provide as much information as was available.

PURPOSE AND SCOPE

The present investigation examined fatal crash data in an effort to determine factors responsible for the increase in 1977 Virginia traffic fatalities. The Fatal Accident Reporting System (FARS) was used to analyze what, if any, changes in the distributions of accident characteristics (driver, vehicle, environment, and person) are useful in explaining the elevated death rate from motor vehicle accidents. (The reader should be cautioned, however, that a difference between the groups on a particular variable does not imply causation but only association.) A secondary purpose was to pilot test the use of FARS as an indicator of characteristics of Virginia traffic fatalities.

METHOD

Descriptors of the fatal accidents such as driver demographics, human factors, vehicle characteristics, and road conditions were examined using the FARS. Distributions of these various descriptors were compared for 1976 and 1977 Virginia traffic fatalities by applying chi-square (χ^2) tests for statistically significant differences.

The Fatal Accident Reporting System

The FARS contains information on fatal traffic accidents that occur in the fifty states, the District of Columbia, Puerto Rico, Guam, and other U. S. protectorates. It is a computerized data base which utilizes sources such as police accident reports, driver license files, vital statistics reports, and, occasionally, medical reports and hospital records.^(3,4) These data are provided by the states, and while sources may vary to some degree from state to state, the FARS has been reported to be "the only known accident file that is complete, national in scope and reports compatible data in a standard form."⁽⁴⁾

The FARS was used in the present study because, as a computerized data base, it appeared to provide the most efficient means of obtaining Virginia fatal accident information from a variety of sources, and it contained information not otherwise readily available.

RESULTS

Data obtained from FARS are tabulated and presented according to three levels: accident, vehicle/driver, and person. For 1976, 808 accidents involving 1,274 vehicles and 2,049 persons were studied. Eight hundred seventy-one accidents involving 1,414 vehicles and 2,211 persons were analyzed for 1977.

Accident Level Factors

Accident level factors generally represented accident location and time descriptors, and environmental factors such as weather.

Distributions of accident locations were similar for 1976 and 1977 fatal accidents. As seen in Table 1, road alignment (straight versus curve), grade (level versus grade), and area of accident (urban versus rural) variables were distributed much the same for 1976 and 1977 fatal crashes, with none of the differences being statistically significant. Classification of trafficway, however, was found to differ for 1976 and 1977, with interstate and other U. S. route accidents increasing from 8.3% to 10.3% and 27.6% to 33.5%, respectively, from 1976 to 1977, $\chi^2 (5) = 14.03$, $p < .05$. There was an increase in accidents occurring during daylight hours in 1977 (from 40.7% to 43.9%), however, this difference was not statistically significant. It should be noted that in some cases (and in all of the following tables) the data were unknown, and for this reason the totals will not necessarily be the same for all categories of variables.

Table 1

Accident Variables Examined for Fatal Crashes Occurring
in Virginia During 1976 and 1977

<u>Variable</u>	1976 (%)	1977 (%)
Road Alignment		
Straight	64.6	60.6
Curve	35.3	39.3
Grade		
Level	53.3	55.5
Grade	46.0	44.4
Area of Accident		
Urban	32.3	31.1
Rural	67.6	68.3
Classification of Trafficway ^a		
Interstate	8.3	10.3
Other Limited Access	1.1	1.0
Other U. S. Route	27.6	33.5
Other State Route	21.2	21.0
County Road	23.4	20.6
Local Street	17.3	13.2
Lighting Conditions		
Daylight	40.7	43.9
Dark	39.1	38.2
Dark-Lighted	14.2	12.5
Dawn-Dusk	5.9	5.4

^a $p < .05$

Vehicle/Driver Level Factors

Vehicle related factors are shown in Table 2. While most of the distributions were similar for the two years, 1977 fatalities showed an increase in the involvement of vehicles with one or two occupants (as opposed to three or more occupants), $\chi^2 (7) = 14.45$, $p < .05$. Vehicle body types were roughly the same for the two years, but, as seen in Table 2, there were some changes in the distributions of vehicle weight, with the vehicles involved in fatal crashes in 1977 being slightly heavier than those involved during 1976, $\chi^2 (8) = 22.83$, $p < .01$.

Table 2

Vehicle Related Variables Examined for Fatal Crashes
Occurring in Virginia During 1976 and 1977

<u>Variable</u>	<u>1976</u> <u>(%)</u>	<u>1977</u> <u>(%)</u>
Related Vehicular Factor		
Not Applicable	13.1	12.2
None	79.7	82.9
Tires and Wheels	3.5	2.4
Brake System	0.9	0.3
Other	1.2	0.9
Number of Occupants ^a		
One	51.6	55.5
Two	17.7	19.9
Three	7.7	6.2
Four	3.6	2.8
Five	1.5	1.8
Six	0.5	0.3
Seven or More	0.8	0.6
Vehicle Body Type		
Automobiles	62.6	61.5
Motorcycles/Mopeds	4.9	4.5
Buses	0.3	0.6
Special Vehicles ^b	0.3	0.9
Small Trucks	9.7	10.9
Large Trucks	7.3	8.9
Vehicle Weight (lb.) ^c		
Not Applicable	4.7	4.5
1-2 Thousand	10.0	9.8
3-4 Thousand	43.3	40.5
5-6 Thousand	5.5	3.3
7-8 Thousand	0.5	1.6
9-20 Thousand	1.9	1.1
Over 20 Thousand	3.9	5.2

^a $p < .05$

^b The category "special vehicles" includes police cars, ambulances, etc.

^c $p < .01$

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Table 3 presents some of the driver related variables examined for the fatal crashes occurring in Virginia. In 1977 there were fewer drivers involved in fatal crashes who were considered impaired (asleep, inattentive, other driver impairment, etc.), $\chi^2 (5) = 17.48$; $p < .01$. Status of license was fairly similar for both groups of drivers, with slightly under 2% of the drivers being unlicensed. In 1977 a slightly lower percentage of the drivers were charged with a violation; however, this difference was not statistically significant.

Table 3

Driver Related Variables Examined for Fatal Crashes
Occurring in Virginia During 1976 and 1977

<u>Variable</u>	<u>1976</u> <u>(%)</u>	<u>1977</u> <u>(%)</u>
Driver Related Factor ^a		
Not Applicable	13.1	12.2
None	31.3	33.4
Asleep or Inattentive	4.7	2.7
Other Driver Impairment	1.0	1.0
Driver Violation	47.2	46.4
Status of License		
Not Applicable	13.1	12.2
No License Required	0.5	1.1
No License	1.6	1.8
Licensed — Not This Vehicle, or Expired	1.0	0.4
Valid License	78.5	79.1
Suspended-Revoked	3.1	3.2
Violations Charged		
Not Applicable	13.1	12.2
No	63.4	65.4
Yes	16.1	15.2
Pending	5.3	5.3

^a $p < .01$.

Previous driving records of drivers involved in fatal accidents are shown in Table 4. These variables include previous convictions for driving while intoxicated (DWI), moving violations (MV), speeding, and recorded suspensions and accidents. It was found that the 1977 drivers had been involved in fewer previous accidents than the 1976

drivers, although this difference was not statistically significant. For most of the categories of traffic offenses, the 1977 drivers had significantly fewer previous convictions (see Table 4).

Table 4

Driver Related Variables Examined for Fatal Crashes
Occurring in Virginia During 1976 and 1977

<u>Variable</u>	<u>1976 (%)</u>	<u>1977 (%)</u>
Previous DWI Convictions		
None	78.0	83.7
One	2.4	2.0
Two or More	3.1	0.2
Previous MV Convictions ^a		
None	49.6	57.9
One	14.8	15.9
Two	7.1	6.6
Three	3.7	2.7
Four	2.8	1.0
Five or More	5.4	1.9
Previous Speed Convictions ^a		
None	51.4	58.9
One	18.8	17.0
Two	6.0	6.8
Three	3.7	2.3
Four	2.2	0.3
Five or More	1.5	0.6
Previous Record Suspensions ^b		
None	71.3	77.0
One	6.8	4.8
Two	2.6	2.1
Three	1.4	1.3
Four or More	1.6	0.6
Previous Accidents		
None	59.2	63.7
One	17.7	16.0
Two	3.9	4.4
Three	2.0	1.3
Four or More	0.9	0.3

^a p < .01

^b p < .05.

Person Level Factors

The use of safety restraints by persons involved in fatal accidents in Virginia in 1976 and 1977 was examined (see Table 5). An attempt was made to analyze the safety belt usage data in terms of the seating position of the vehicle occupants, however, sufficient data existed only for the left front seat (driver) and right front seat positions. There were changes in the percentages of seat belt usage, particularly in the case of persons in the driver's seat, who showed a decrease in seat belt usage in 1977, $\chi^2 (2) = 10.40$, $p < .01$.

Table 5

Person Level Variables Examined for Fatal Crashes
Occurring in Virginia During 1976 and 1977

<u>Variable</u>	<u>1976</u> <u>(%)</u>	<u>1977</u> <u>(%)</u>
Active Restraints (Front Seat Left) ^a		
None Used/Not Applicable	41.5	45.5
Restraint Used	6.3	5.7
Unknown	5.7	4.0
Active Restraints (Front Seat Right)		
None Used/Not Applicable	12.4	14.4
Restraint Used/Type Not Specified	0.24	0.27
Unknown	3.3	1.6

^a $p < .01$.

LIMITATIONS

In the project reported here several problems were encountered which may also be encountered by other potential state users of FARS. It should be made clear that these comments apply only to the system as it relates to the state user. In that the system may not have been intended for state use, these comments are not criticisms of the system itself, but relate only to its application for small users.

Accessing FARS

The first step in obtaining access to the fatal accident data was to arrange for system use with the timesharing organization which

maintains the FARS files for the National Highway Traffic Safety Administration (NHTSA).^{*} In the case of Virginia, in order to go outside state agencies and contractors for software or timesharing services, sufficient justification as to the need and quality of the service must be provided. This justification must pass through the administrators and data processing personnel in the user's agency, the data processing coordinating division for the state as a whole, and the state's Management Information Director in the Governor's Office. This justification, if approved, is returned to the state ADP Division, which then executes the contract with the provider of the service. Thus, the first task to be performed was to amass information for this justification.

Attempts were made to acquire information concerning the system and the software used to access the system from the contractor, but such information was not forthcoming. Repeated attempts to discover why this material was never forwarded were unsuccessful. After the regional office of the NHTSA had been requested to intervene, it was discovered that the contractor would provide no system information until a signed contract was received. Since a contract could not be executed until system information was provided for justification, this became a rather circular process. This problem went unresolved for some time, until the need for the use of the system became so great (i.e., the increase in fatalities in 1977 became a serious problem) that the state approved the contract without justification. Had an emergency situation not arisen, the use of the FARS files could not have been approved in the state. If similar justification is required in other states, obtaining approval may be just as difficult as it was in Virginia. It is recommended, then, that the NHTSA obtain information for service justification and provide it to states in need of it at no charge.

Using the System

The next step in relation to using the FARS data was to become familiar with the system through use of the manuals and through training. Since the FARS was designed as a user oriented system, this was not anticipated to be a problem. However, use of the system was found to be less easy than it was purported to be.

^{*}Mention of the timesharing organization by name is prohibited by contract.

After receiving the manuals, the investigators were provided training by the timesharing contractor. This training was a one-day session comprising two distinct units. The first four to five hours were delivered by the contractor and dealt exclusively with the timesharing system and utilities. This training was comprehensive, well organized, and well presented, and obviously involved considerable advance preparation. This was not found to be the case for the second unit of training, which consisted of one hour of instruction on actual use of the FARS file and was delivered by NHTSA personnel. Only the most basic information was presented. Much information had to be discovered on a trial-and-error basis, which resulted in a great deal of unexpected expenditure of time, effort, and money.

Despite training, then, a great deal of reliance had to be placed on the manuals. While the manuals were understandable, the reading of them was not always helpful in relation to content areas. Without training, use of these manuals may be less than adequate for state users. In addition, in the course of using the system, it became necessary to perform activities which would have been difficult for noncomputer oriented state users who did not have data processing aid readily available.

Considering the problems encountered by Virginia, it is recommended that persons undertaking work with the FARS files solicit prior assistance in data processing. Then, if problems similar to those encountered in Virginia arise, solutions can be derived in an efficient and timely manner.

Cost of System Use

Once use of the system had begun, several factors relating to the cost of its use became apparent. The design of the FARS is such that the expense involved may be a deterrent to users at the state level, since state personnel will often be operating on limited computer budgets. As an example, the largest cost in a FARS run is incurred through reading the master file. The cost of producing tables is relatively small compared to the cost of reading the file, and the incremental cost per table, after the first table is produced, is small. It would make sense then to produce as many tables as possible with each run to avoid having to reread the file. However, in most of the sample runs supplied by the NHTSA, no more than two or three tables were produced per run, and NHTSA personnel had no information on the maximum number of tables possible from one run. Additionally,

if multiple runs are to be made against one state's data, it would seem unnecessarily costly to read and reread the master file to extract that state's data. It would be more efficient to create a file of state data which would be considerably less costly to read and to make multiple runs against that file.

State users should realize that the system is comparatively expensive before they begin usage. This is not readily discernible from contract information, since the billing schedule is difficult to comprehend and translate. Users should be aware of unmentioned costs in relation to billing. For example, Virginia was billed for unstated charges for manuals which were distributed at the training session. Also, billing is not done in a timely manner and may be delayed up to four to five months. The greatest expense is incurred when operating in the interactive mode. The FARS may be accessed by interactively building a TPL file of table-producing commands which are then transferred and run against the master file in batch mode. For very large files which utilize many table commands (for economy purposes), the cost of interactive file building can be very high, independent of actual FARS data runs. It is recommended that a batch method of file building be introduced, with interactive editing available if needed. This would be considerably less costly. It is also recommended that if multiple runs are necessary, state users take advantage of the utility used to create data files for one state only. This is accomplished with a routine written by NHTSA personnel called "filepars", which is easily used and relatively inexpensive as long as the only contingency for case selection is state of accident; the program can be inefficient if multiple levels of contingencies are required.

Problem Data

There were several inadequacies in the data which limited the scope of the study from what was originally envisioned. For all three categories of factors, there were data which might have been appropriate for study except for format problems, insufficient information, and/or apparent coding inconsistencies. Several variables were involved but only a few will be mentioned here. A more complete discussion of these variables appears in Appendix A.

On the accident level, there were insufficient data for Emergency Medical Service (EMS) for an analysis to be made. In most cases, type of EMS was unknown.

For the vehicle/driver level, inspection status of the vehicles involved in fatal accidents would have been interesting to examine;

however, for both 1976 and 1977, the inspection status of approximately 77% of the vehicles was unknown. Similarly, little data were available for odometer reading. For the driver training variable there seemed to be some inconsistencies in the coding from year to year.

In summary, compared to data sources usually available to state users, the FARS is an expensive system. It appears that few attempts to improve the efficiency of the system and cut costs have been made, and are indeed unnecessary as long as the NHTSA is the primary (or only) user. State users are encouraged to investigate batch file building, to create subfiles of their state's data, and to carefully monitor billing cost. The use of the FARS in evaluating characteristics of Virginia traffic fatalities is not encouraged because of the difficulties encountered in accessing the system, the expense of the system, and the limitations in the data.

DISCUSSION

While it was expected that one or more factors would emerge as a likely explanation for the increase in traffic fatalities last year, this was not found to be the case. The statistics for 1976 and 1977 were found to differ significantly in the case of some variables, but there was no indication that a change in Virginia's highway safety program would be warranted.

Of the accident level factors investigated, the only category which was found to differ significantly from 1976 to 1977 was classification of trafficway. Traffic fatalities in 1977 showed an increase in accidents occurring in areas categorized as open country as opposed to business or residential areas. A slight increase in accidents during daylight hours was found for 1977 fatalities but the increase was not found to be significant. Other environmental factors (such as road alignment and grade) were found to be similar for the two years.

In terms of vehicular variables it was found that the vehicles involved in fatal crashes in 1977 were slightly heavier than those in 1976. There was also a decrease in occupancy rates in 1977. Factors such as status of vehicle inspection would have been amenable to the development of countermeasures; however, insufficient information existed to ascertain anything concerning vehicle inspection. For both 1976 and 1977, the inspection status of approximately 77% of the vehicles was unknown. Similarly, for other vehicular variables such as odometer reading, little data were available.

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For the driver related variables, nothing emerged as an indicator for predicting those drivers likely to become involved in fatal accidents. Fewer drivers were considered impaired (asleep, inattentive, etc.) in 1977, and the status of license was fairly consistent for both groups of drivers. Previous driving record information also failed to provide any indicators for the prediction of fatal-accident-prone drivers. For 1977, there were fewer drivers involved in fatal crashes who had previous traffic convictions. A slightly lower percentage of the 1977 drivers had been involved in previous accidents; however, this difference was not found to be statistically significant. No conclusions were possible concerning driver training because of inconsistencies in the coding of the data from year to year.

Few conclusions were possible for person level variables due to problems with these data. Due to inconsistencies in the data and problems in formatting, data on blood alcohol levels, for example, could not be analyzed. An attempt was made to analyze the safety belt usage data in terms of seating position in the vehicle; however, sufficient data existed only for the front seat left (driver) and front seat right positions. There was a decrease in seat belt usage in 1977 among persons in the driver position, which indicated a need for continuing efforts to promote and increase seat belt usage.

In summary, no one factor emerged as an explanation for the 1977 increase in traffic fatalities. It seems that no change in Virginia's highway safety program is warranted, but there continues to be a need for promotion of seat belt usage.

For all levels of factors, much data were unusable because of problems in format, insufficient information, and apparent inconsistencies in coding. The FARS was not found to be easily accessible and was also comparatively expensive. For these reasons, it was concluded that use of the Fatal Accident Reporting System does not appear to be the best method of evaluating characteristics of Virginia traffic fatalities.

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APPENDIX A
DATA PROBLEMS

Three basic problems were encountered in attempting to use data from the FARS files. The first problem involved inadequate or insufficient data and occurred when the bulk of the observations for particular variables were either missing or unknown. The second problem involved obvious coding inconsistencies over time. In this case, observations which were coded in one category in one year were coded in another category the next year, which invalidated cross year comparisons. The third problem involved inconsistent totals, in that the total number of observations for each variable did not always correspond to the number of events being counted. For instance, tables for accident level variables should always contain one observation per fatal accident and, thus, the total number of observations for each table should be the same. This was not, however, always the case.

While the occurrence of one or more of these problems does not always invalidate the use of a particular variable, it does cast doubt on the reliability of the data for that variable. Each of these problems and the variables to which they apply are discussed in more detail below.

Problem 1: Insufficient Data

Table A-1 presents the variables found to contain meaningful "gaps" in the data and where these "gaps" occurred. The category of "other bad data" includes all undefined blanks and other data entries having no corresponding meaning in the coding scheme. It should be noted that both 1976 and 1977 data were examined and that the percentages shown in this table represent the largest percentage of occurrence found in either year. Thus, the percentages do not total to 100%.

There were also a number of variables, such as hit-and-run and fire/explosion, where more than 90% of the observations were marked "not applicable". In these cases, an "N/A" observation was interpreted to be either "no" or "not applicable," although the distinction between the two is unclear.

Table A-1

Variables Involving Insufficient Data

<u>Variable</u>	<u>Type of Insufficiency, %</u>		
	<u>Unknown</u>	<u>Not Applicable</u>	<u>Other Bad Data</u>
Emergency Medical Service	93		31
School Bus	99		
Towed Vehicle	98		
Location	12	82	
Drinking Involved	70		
Inspection Certificate	77	16	
Number of Occupants	3		13
Odometer Reading	86		14
Towaway	70		
Vehicle Weight	17	4	13
Driver Training	81	12	
Alcohol Test Results	88		
Extrication	71		
Ejection	86	91	
State-Vehicle			
	ALL VIRGINIA		
State-Person			

Problem 2: Coding Inconsistencies

As mentioned previously, several comparisons were invalidated due to inconsistencies in coding across years. In other cases, since the coding problems involved only the "unknown" and "not applicable" categories, comparisons were successfully made. However, such apparent inconsistencies throw doubt upon the reliability of the data base, since the implication is that less obvious but no less real inconsistencies may exist without the user's knowledge.

The variables found to contain coding inconsistencies include:

- Emergency Medical Services
- School Bus
- Weather/Atmosphere
- Extent of Deformation
- Drinking Involved
- Driver Training
- License Restrictions
- Extrication
- Ejection

Problem 3: Inconsistent Totals

The following variables contained totals inconsistent with the events or items they were to measure.

- Fire/Explosion
- Location
- Towed Vehicle
- Contributing Vehicular Factor (1)
- Registration State
- License State
- Model Year

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