

NATIONAL TRANSPORTATION SAFETY BOARD

# SPECIAL STUDY

THE STATUS OF PEDESTRIAN TRAFFIC  
SAFETY EFFORTS OF THE  
DEPARTMENT OF TRANSPORTATION



NATIONAL TRANSPORTATION SAFETY BOARD  
Washington, D. C. 20591  
REPORT NUMBER: NTSB-STS-71-2

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**APPROVED: MAY 12, 1971**

E R R A T A

The following changes should be made to the subject report:

Page 4, column 2, under the heading "Truck Transportation and Pedestrian Safety," after line 7, insert:  
"The report for 1967 shows 104 pedestrian fatalities."

Page 4, column 2, delete the footnote and the referencing asterisk appearing in line 8 of the text.

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**Magnitude of the Problem**

By any accounting, pedestrian fatalities on streets and highways are a significant portion of our national transportation accident losses. The number of pedestrian fatalities in the United States during the past 3 years, 1967-69, exceeded by 72 percent the total of fatalities in all aviation, marine, railroad, and grade-crossing accidents combined—29,000 compared with 16,900.<sup>\*</sup> Eighteen percent of highway deaths in these 3 years were pedestrians (2). The number of fatalities in 1969 reached 9,800. Pedestrian fatalities are a serious urban problem; in metropolitan areas as a whole, at least half the traffic fatalities are pedestrians (5).

**General Characteristics of the Problem**

Highway pedestrian fatalities declined in the United States from 1937 to 1961, but have been on the increase since 1962 (2). Nearly twice as many pedestrians are killed in motor vehicle accidents in urban areas as in rural areas; nonfatal injuries have been from five to nine times as numerous in urban areas as in rural areas (2). This reflects the high concentration of people and automobiles in urban areas. For both areas,

The numbers in parentheses throughout this study relate to the list of references attached.

\*Computed by NTSB staff from data provided by Bureau of Aviation Safety, Federal Railroad Administration, and National Safety Council.

more of such fatalities occur at night than in the daytime (2). Although all ages are affected, more than half the fatalities (53 percent) are in two age groups, those below 15 and those above 64 (2); the pedestrian death rate per 100,000 population (in that group) is highest for those 65 and above (2).

These characteristics appear to offer a serious challenge to safety efforts in view of population trends. With the exception of children under 12 months of age and certain institutionalized persons, almost the entire population are pedestrians in contact with traffic at one time or another. The population, now at 203,000,000, will increase to more than 214,000,000 in 1975, and for the year 2000, it is estimated at more than 280,000,000 (25). Unless significant changes occur, the number of fatalities will be expected to increase at least proportionately. Moreover, there are three aspects of this growth which accentuate the pedestrian safety problem:

- a. the continuance of a high proportion of youngsters under 15;
- b. the increase in proportion of those over 65 years of age as health conditions improve; and
- c. the increase in proportion of people living in urban and metropolitan areas.

These trends would be expected to maintain or to increase the likelihood of pedestrian accidents. It is to be noted that the predictions of reduced

highway fatalities based upon vehicle crash safety do not apply to pedestrians. In 1970, total highway fatalities decreased by about 2 percent while amount of travel exposure increased. Pedestrian fatalities, on the other hand, increased about 1 percent.

#### Characteristics Derived from Accident Research

Most of the studies on pedestrian accidents are of a descriptive nature, analyses of accident data, of the characteristics of victims, of concomitant conditions, and of the injuries sustained. Controlled scientific evaluations of countermeasures are virtually nonexistent (20, 32). A goodly proportion of the published work on pedestrian behavior was done in European countries, so that there is a question whether the results can be generalized to the American culture. Often the published studies suffer from a lack of exposure data, which is critical to an interpretation of the analyses. However, some factors do appear to be sufficiently supported by empirical data, and they are presented here.

Alcohol is heavily implicated in adult pedestrian fatalities. In four studies, approximately 45 percent to 75 percent of "adult" fatalities in urban areas were found to have measurable blood alcohol; 33 percent to 43 percent had levels of .10 percent and higher, compared with only 9 percent of the noninvolved pedestrians sampled while using the streets at similar times and places. Of those fatalities with alcohol, 58 percent to 83 percent had levels of .10 percent and higher; 44 percent to 69 percent had .15 percent and higher (4). Alcohol involvement appears far more characteristic of middle-age fatalities than of those 65 and older (16, 39).

Over 90 percent of pedestrian fatalities aged 15 and over are reported as never having been licensed to drive (5). This was in a study in the mid-1930's; the percentage is almost certainly lower today. Although exposure data are lacking to make this datum fully interpretable, it does appear that pedestrians' unfamiliarity with the driver's task is an important factor. Even if the current figure is as low as 25 percent, this is still very significant.

Illumination—or perceptibility of each other by driver and pedestrian—appears to be clearly involved, but the extent to which increased illumination contributes to pedestrian safety cannot be estimated from available data (5, 9).

Although exposure data are lacking, it is established that over half the fatalities are in two age groups, below 15 and above 64. Over half the nonfatal injuries occur to children under 15 (2).

In the cities studied (17, 39), over half the fatalities occurred in the 8-hour period from 4 p.m. to midnight. This is the period of homebound traffic, of social activities, and, especially in the fall and winter months, of fewer daylight hours.

A possibly important area of research is that which is based on experimental collisions of cars and anthropometric dummies (29, 30, 31). The information generated has implications for vehicle redesign for pedestrian protection. Further discussion on this is provided later in this report.

#### The Scope and Focus of Pedestrian Safety Efforts

Pedestrian safety, until the enactment of the Federal highway safety laws of 1966, was entirely the responsibility of State and local political units. Only one nongovernmental organization of national scope has been active in this area in a major way. That is the American Automobile Association (AAA), which has been heavily involved since 1937. The AAA published "Pedestrian Protection" in 1939, "Planned Pedestrian Program" in 1958, and "Manual on Pedestrian Safety" in 1964 (5). Also the AAA has sponsored the School Patrol Program for the safety of school children and community programs for over 30 years. Just this year, the Highway Research Board of the National Academy of Sciences—National Research Council established a committee on Pedestrian Safety.

However, the institutional and associational activity focused on pedestrian safety is not extensive, especially when compared to that of

approximately 40 professional and trade associations which deal primarily with vehicular, road, and commercial aspects of highways.

#### Department of Transportation Activities in Support of Pedestrian Safety

In April 1969, the National Highway Safety Bureau (NHSB)\* published "Pedestrian Safety," Volume 14 in its series of Highway Safety Program manuals (24). This is a rather comprehensive manual and its emphasis, by law, is on assistance to the local jurisdictions in assessing their own problems, and in applying effective countermeasures to meet the requirements of Highway Safety Program Standard 4.4.14, Pedestrian Safety. Until its reorganization, the NHSB had a small division—two professional people plus three secretarial clerical employees—devoted specifically to pedestrian safety, out of a total staff of about 350. Less than \$400,000 has been spent through fiscal year 1970 on specifically labeled pedestrian safety research (nothing for demonstration) on this problem, out of a total of approximately \$62 million spent for research and development and demonstrations since establishment of NHSB, some 0.64 percent of the total.

Approximately \$161 million has been spent in the same period on State programs in highway safety, about \$3.28 million of this, or 2 percent, for pedestrian safety programs. In a news release dated March 2, 1971, NHTSA rated the various States on the degree of their conformance with 16 Highway Safety Program Standards, using letter grades as follows: A = Fully implementing, B = Substantial conformance, C = Demonstrates acceptable progress, and D = Does not demonstrate acceptable progress. Standard 314, Pedestrian Safety, has the lowest number of B's, 11, the highest number of C's, 40, one D, and no A's. This means that progress with respect to the Pedestrian Safety Standard is somewhat slower than in most of the areas covered by the other standards.

\*Now National Highway Traffic Safety Administration (NHTSA).

In the area of motor vehicle safety, 29 standards have been published by the NHSB. One of these is specific to pedestrian safety: Standard No. 211 prohibits projections on wheel nuts or hub caps on wheel discs which might injure pedestrians. Also, Standard 108 requires backup lights to be visible to pedestrians at given distances and positions relative to the rear of the vehicle. The effect of these standards in reducing injuries is unknown.

NHTSA is currently in the process of obtaining some information by way of their contract research and development efforts on which to base vehicle standards for pedestrian protection in the future. One proposed standard on bumper height and design is expected to have some implications for pedestrian protection; however, the effects are not yet established. Two contract areas in particular have relevance here. First, the three completed contracts on the experimental safety vehicle have implications for pedestrian safety, particularly the contract with Fairchild Hiller (13, 14, 15). Secondly, a contract with Cornell Aeronautical Laboratory includes investigation of accidents to pedestrians, with a view to redesign of the vehicle to reduce the injuries. The Secretary of the DOT recently announced the next steps, contracts for the design of safety cars for testing. NHTSA has contracted approximately \$8 million for research and development in the Experimental Safety Vehicle concept. However, the proportion of this effort which will result in pedestrian protection cannot be estimated until the vehicles are tested.

The recent Departmental reorganization removes from NHTSA the two persons who previously constituted the professional staff of the Division of Pedestrian Safety. These personnel have remained with the Federal Highway Administration (FHWA). They are concerned with those parts of the National Highway Safety Program Standard and technical cognizance of program funds to State and local agencies which encompass the highway-related aspects of pedestrian safety. The educational aspects of pedestrian safety are part of the mission of the new Division of Driver and Public Education in NHTSA.

The injury-reduction aspects of pedestrian safety do not now appear in the title of any organizational entity of NHTSA; however, some efforts are proceeding within offices which do not carry a "pedestrian" label, in the form of accident investigations by contract teams which are studying pedestrian accidents, and supervision of research contracts which contain some pedestrian-injury aspects.

The word "pedestrian" does not appear in the titles of any offices or divisions of the National Highway Traffic Safety Administration, nor does it appear, so far as the Board can determine, in planned organizational changes in the Federal Highway Administration. So far as is ascertainable at the present time, this reorganization does not constitute an enlargement of the Department's effort regarding pedestrian safety. However, there are some indirect benefits to be expected from other programs.

#### Other DOT Programs which Might Influence Pedestrian Safety

Over \$9 million of NHTSA funds have gone into research, demonstration, and State program activity regarding alcohol and highway safety through fiscal year 1970. Twelve staff members are currently assigned to the Office of Alcohol Countermeasures of NHTSA. While most of this is directed to the driver, it would be reasonable to anticipate some effect on pedestrian safety in two possible ways: first, fewer pedestrians being hit by automobiles operated by drivers under the influence of alcohol, and secondly, one might expect a somewhat reduced intake of alcohol on the part of pedestrians because of the publicity. We would expect the latter effect to be much the lesser. Both effects would be expected to be slight. Neither effect has been discussed as a goal of the program. Presumably, efforts which broaden driver education coverage in the whole adult population would also benefit pedestrian safety, but this effect might not be large because of the proportion of fatally injured who have never held a driver's license.

Another activity which might have a more direct impact on pedestrian mortality and injury

is the NHTSA effort in Emergency Medical Services (EMS). Such services would minister to people injured on the highways and streets regardless of whether they were occupants of motor vehicles or were pedestrians. Over \$19.6 million of NHTSA funds have been devoted to research, demonstration, and State programs on EMS, and eight members of the NHTSA staff are devoted thereto. Unfortunately, it is not possible, from presently available data, to estimate the magnitude of benefit in reduced fatalities that might be expected from EMS, irrespective of cost. There is general agreement that it should help to reduce human suffering and to prevent worsening of the condition of the traffic-injured by inept handling by untrained ambulance personnel. The Highway Safety Program Manual on Emergency Medical Services was published to provide guidance with respect to program Standard 4.4.11, Emergency Medical Services (23).

#### Truck Transportation and Pedestrian Safety

It is of some interest and importance to review the segment of pedestrian safety that is related to the Bureau of Motor Carrier Safety (BMCS), particularly the role of truck transportation in pedestrian fatalities. In the BMCS report covering 1965 and 1966 accidents, 90 pedestrian deaths are shown for 1965 and 77 for 1966. The 1968 report shows 86 fatalities.\* These figures are based on accident reports from "large motor carriers of property" on accidents involving interstate commerce-related vehicles. The BMCS reports showed a total of 4,557 fatalities in accidents of large interstate motor carriers of property during this same period, so that the total of 253 pedestrian fatalities represents only 5.6 percent of the total of these fatalities, compared to about 18 percent pedestrian fatalities in all highway accidents. Among other things, this difference may result from comparatively less urban than rural driving among interstate carriers.

\*There was no report for the year 1967.

The National Office of Vital Statistics of the Public Health Service reports pedestrian deaths by "goods transport vehicles only" as follows:

<i>Year</i>	<i>Fatalities</i>
1965	880
1966	870
1967	937

These latter figures are, of course, derived from a much larger universe of trucking operations than that represented by the BMCS reports, and the types of trucks involved are different. Trucks apparently account for about 10 percent of the annual pedestrian fatalities and make up over 17 percent of total vehicle registrations, which is a very favorable ratio and even more so when it is considered that the mileage exposure of trucks is generally much higher than that of passenger automobiles. Nevertheless, these are still large numbers of fatalities; they are equal to more than half the annual number of fatalities in each of aviation, marine, and grade-crossing accidents, and the number exceeds the total railroad transportation fatalities other than grade-crossing.

The proportion of truck involvement in pedestrian fatalities appears to be higher in urban areas. One study of 240 consecutive pedestrian fatalities showed that trucks of various sizes and buses in the pedestrian-crowded environment of Manhattan accounted for 35 percent of the fatalities (21a, 34). Furthermore, the mechanism of the injuries was strikingly different. Some 89 percent of the pedestrians struck by heavy trucks were killed by being run over by the wheels, a distinct mechanism of injury, while only 10 percent of those killed by automobiles and taxis were thus run over. The difference may be due to the higher bumper heights of heavy trucks and the relatively exposed sides of trucks, which may allow pedestrians to enter easily under the fronts and sides.

The BMCS is in a strategic position due to the possible scope and widespread influence of its regulations. These regulations encompass the

design and/or performance of new vehicles put in service, their condition while continuing in service, maintenance procedures and record-keeping by vehicle users, qualifications of drivers and driver operations, emergency procedures, and what is to be included in accident reports. As of November 1970, 44 States had agreed to adopt the regulations of BMCS (in whole or in part), and, where these regulations are so adopted, they will be effective in urban environments where pedestrians are present and truck involvement is more frequent than in interstate commerce.

Although a number of the regulations of BMCS would have some effect in helping to avoid accidents, including pedestrian accidents, the Board has found no regulations in the group which are for the specific purpose of avoiding pedestrian accidents. A number of possibilities for regulations for the pedestrian environment are such items as backup buzzers, alternate methods of warnings on crowded streets instead of highway horns, control of off-tracking effects at corners by vehicle design, mechanical methods of keeping pedestrians from under the wheels of trucks, and specific rules of operation in pedestrian environments. In addition, the Board has been unable to find any example of a report of an accident investigation involving a pedestrian published during the last 5 years by the BMCS and the predecessor agency (Interstate Commerce Commission).

#### The Possibilities in Pedestrian Injury Reduction

The design of the vehicle to minimize occupant injuries has been a major approach in recent years, and changes in this area are the basis for predictions of fewer occupant fatalities in the future. No similar action has been taken in pedestrian safety. About 1957, attention began to be directed to the problem of severe injuries caused by ornamental projections on the fronts and rears of automobiles. These projections have been eliminated, to a large degree, by voluntary actions of vehicle manufacturers, although such ornaments are still being bought and installed by owners.

Activity in the state of the art can be gauged by the number of papers written. Since 1959, only a very small number of papers has been written in this field, about 20 published papers in 10 years, including those of foreign origin. These studies have been primarily descriptions and analyses of the mode of injury causation with existing vehicles, and efforts to quantify the sources of injury by instrumental tests of existing vehicles. There have been almost no projective studies which sought to find solutions beyond the frame of reference of existing vehicle experience. In historical perspective, it would appear that the progress of pedestrian injury reduction is presently at a stage similar to that of occupant crash safety after the specific sources of injury had been identified, except that no effort has been made to invent devices for pedestrian protection that would parallel seat belts or dash panel cushions for occupant protection.

The reason for this lack of inventiveness may be found in two impressions that have been fostered by past concentration on tests of existing vehicles. The first is that "blunt trauma," (i.e., force acting over much of the pedestrian's body) is the source of many fatalities, and that these traumas cannot be countered. The second impression is that the impact which now occurs between the pedestrian and the pavement after the initial impact is irreducible and must always cause severe injury. These uncontrolled contacts usually eventuate with contemporary vehicles. These impressions, however, do not appear to be forever limiting, but indicate that the existing designs have not had a purpose in injury reduction. Therefore the scope of practical design corrections would necessarily encompass both problems. Past efforts have not attacked either problem. Thus it could well be that the scope of the few past efforts has been far too limited to reveal whether a solution to the problem can be found.

#### Possible Benefits to Pedestrian Safety from Highway Technology in the Federal Highway Administration

The pedestrian safety effort in the Federal Highway Administration provides close associa-

tion with and ready access to the technology of highways and traffic control. Important results in highway safety have flowed from actions of the FHWA, and its predecessor the Bureau of Public Roads, by a process of designing highways for efficient traffic flow. The fatality rate of the Interstate Highway System, which is, on the average, only one-half the rate of earlier roads, is a case in point. Current FHWA programs, such as the TOPICS,<sup>\*</sup> which increase capacity and safety of highways in cities, and the spot improvement programs, which are based partly on safety records, are other examples. The very large Federal expenditures for highway programs by the FHWA have produced gradually improved safety for the motorist and truck operator as a concomitant effect.

The question for pedestrian safety is whether or how the same type of spin-off results can be achieved without any funded programs to improve pedestrian transportation. There is no national goal in facilitating pedestrian transportation and no fund source for that purpose. Clearly, pedestrians will not benefit from transportation-improving programs in nearly the same degree as the motorist and truck operator have benefited. The effect of the absence of these goals and funds is that safety gains for pedestrians will be limited to those indicated by the numbers of specifically designated pedestrian safety personnel in the agencies, and the program funds specifically labeled for pedestrian safety.

Another logical concern might be that efforts made in pedestrian safety, when they stem from highway efficiency consideration, might operate by uneconomically or unfairly hampering pedestrian movement. An outstanding example of this is the almost total lack of facilities for pedestrian traffic on and across the Interstate Highway System, in both urban and rural localities. Pedestrian crossings of these highways at interchanges and elsewhere are far too distantly separated to facilitate pedestrian or bicycle movements, creating a situation in which the highway not only does not aid pedestrians, but is frequently a barrier to pedestrians.

<sup>\*</sup>Traffic Operations Program to Increase Capacity and Safety.

The Verrazano-Narrows Bridge, a spectacular high suspension bridge, and the only surface link between Brooklyn and Staten Island, provides an outstanding example of safety by exclusion. This bridge was designed without pedestrian sidewalks because it was to be funded as part of the Federal Interstate Highway System, which excludes all travel except motor vehicles. Although protests were raised after this fact was discovered by local citizens, it was too late to change the bridge design. As a result, cyclists and pedestrians cannot cross this structure or see the bridge closely or view New York Harbor from the unique vantage point. By contrast, the Brooklyn Bridge, which dates from the 19th Century, has broad sidewalks and carries considerable pedestrian and cyclist traffic between Brooklyn and Manhattan. Precluding pedestrian traffic is a means of providing safety, but it is the exact opposite of the approach used in facilitating highway travel which has resulted in safety gains for highway user interests.

#### Possible Reasons for Less-than-Proportional Effort

It seems a fair assessment that pedestrian safety has not been regarded as a high priority area in the sum of actions of DOT, despite the large numerical losses in relation to others in transportation. However, there may be good reasons for this.

The outstanding apparent reason is that efforts allocated to pedestrian safety, either through local program support or vehicle safety research or standards, may not be considered as effective in reducing total highway fatalities as efforts applied to other fields.

The Federal Government is far removed physically from the points of application of pedestrian countermeasures, other than possible vehicle changes. The Pedestrian Safety Program Manual published by NHTSB provides guidelines to local authorities. However, even at the local level, pedestrian safety is a diffuse problem. Although there is a very noticeable concentration of pedestrian-vehicle collisions in densely settled areas, there are no focal points of application,

geographically or administratively, comparable to the situation with motor vehicles. Enforcement may also be difficult because there is no license for pedestrians to be revoked, and pedestrians often cannot be differentially handled by rules according to their varying abilities.

The nature of the persons who become fatalities almost militates against the most immediate effects of education. Half of the fatalities are children who are at risk over a period of years while their comprehension gradually develops, or the elderly who might be less alert or agile than they were formerly. The use of alcohol by adults, irrespective of their unfamiliarity with vehicles, is a problem long resistant to social reform. The lack of a vehicle-driving background of many fatalities is a factor. These factors may make it difficult to find efficient points of contact for educational efforts. At the very least, these factors tend to require a very broad approach, or long term efforts to obtain an effect.

Another problem in the low status of pedestrian safety efforts by DOT may be that enforcement of pedestrian regulations by ticketing, fining, and pedestrian schooling is a relatively limited phenomenon. These methods are generally justifiable on a cost/benefit basis only where traffic is very heavy, such as in downtown areas of cities or at school crossings. Experience has generally indicated that acceptance by pedestrians of regulations and the enforcement thereof are far less than the acceptance of such by drivers. Countermeasures with high benefit/cost ratios do not abound nor has this area been intensively researched in order to develop effective countermeasures.

It is also to be noted that although pedestrian safety is specifically named in the Highway Safety Act of 1966 (23 U.S.C. §402(a)), it does not appear in a predominant way or with emphasis in legislative background at all comparable to that given to motor vehicle occupant safety. This is partially a result of fewer pedestrian casualties. But it is also true there is no identifiable national pedestrian interest group to draw the attention of legislators or administrators. Interest groups appear to be related to very

specific local conditions or to the demand for countermeasures which sometimes arises from a specific injury or death. There has never been a public clamor for pedestrian safety comparable to that in other modes of (powered) transportation. There are no organizations specific to pedestrian transportation, except rural recreational hiking. There are no groups of "walking teachers" to parallel those who support driver education. There are very few manufacturers of products for pedestrian safety whose designs can produce a market sufficient to support independent research. Vehicle safety changes that might be found necessary for pedestrian survival are very unlikely to carry a benefit to vehicle manufacturers or users. All of these matters tend to reduce the requests for pedestrian safety.

In summary, the present low priority assigned to pedestrian safety in the DOT, both as to a degree of effort (much less-than-proportional to fatalities) and a relatively diffuse focus of effort, is partially explainable. The effects could be somewhat larger than the labeled effort where other safety programs coincidentally assist pedestrian safety. The lower priority also probably exists because of the relatively small legislative background of the subject as compared to that of safety of occupants, the lack of a strong pedestrian economic interest group which constantly draws attention to the problems (as opposed to a large institutional backing for the highway user interest point of view), the appearance of low efficiency of some pedestrian safety efforts based upon education and law enforcement, and an uncertain situation as regards vehicle design methods of reducing pedestrian fatalities. These reasons might well lead to a conclusion that the Federal funds and efforts that might be applied to pedestrian safety would save many more lives if applied to vehicle occupant safety.

#### Other Perspectives on the Appropriateness of the Level of Efforts in Pedestrian Safety

There are many other possible reasons that the allocation of safety efforts more in proportion to fatalities may not be economical. Although these

many reasons explain the situation, the share of DOT efforts for pedestrian safety, nevertheless, is strikingly lower than the proportion of fatalities. The efforts specifically directed to pedestrian safety include about 1 percent of the personnel in NHTSA (even less when in FHWA), about 1 percent of the NHTSA research funds, and about 2 percent of the funds for support of State programs, exerted against a target that constitutes 18 percent of the fatality loss. This means that the collective possible reasons would have to explain a gap in which only one-eighteenth to one-ninth of the indicated proportional effort is directed specifically to pedestrian safety. It is unlikely that side effects from other programs could account for this difference.

Even if the reasons do seem compelling, are there not some other perspectives or other reasons which should justify a more proportional expenditure, or justify new sources of funds that could properly attack the problem? Such perspectives are evident when the part of the population which is suffering the losses is examined, and the fact that some pedestrian protection measures are still relatively unexplored is considered.

Let us suppose that the benefit/cost ratio of pedestrian safety programs is actually less than that of vehicle occupant safety programs, as might be concluded from the variety of problems already discussed. This means that fewer total lives would be saved if funds were reallocated to pedestrian safety efforts from the present balance of NHTSA programs and standards which emphasize driver factors and survival of vehicle occupants.

However, there is an important element of justice, as well as economic efficiency, which must be considered. This important factor is that those classes of persons who are receiving less than a proportional share of effort under the existing balance are those who most need and deserve protection against the risks of highways. As noted earlier, more than half the pedestrian fatalities are persons below the age of 15 or above the age of 64. These persons are in the age groups least competent and least able to

protect themselves by reasons of immaturity or advanced age. There is no doubt that these persons suffer loss because of personal characteristics related to age. In the 15 to 24 age group, by contrast, the proportion of fatalities which are pedestrians is only 6 percent versus 18 percent for the total of fatalities of all ages.

In addition, an unknown proportion of pedestrian losses falls upon persons who have never been licensed to drive or do not own vehicles, and participate in highway transportation in only a minor way. Cities which have a low proportion of vehicle ownership (the outstanding example is New York City) also have a high proportion of fatalities among pedestrians. Presumably slums, either urban or rural, would contain a higher proportion of persons who are at risk from highway movements but benefit to only a minor degree. This factor was predominant some years ago, but has apparently not been studied in recent years. (5)

In part, the inefficiency of educating for and enforcing pedestrian safety requirements arises from these same characteristics, as already noted (35). It therefore appears that these classes of persons suffer from their status in two ways. Not only are they less able to adjust themselves to vehicle traffic, but they may be getting less funded attention because efforts to help them would be less efficient than efforts to help vehicle occupants or to reduce vehicle or highway property damage.

These pedestrian fatalities are part of the cost of highway transportation, but a cost that falls often upon less-than-competent persons who are bystanders to transportation or only minor participants. The cost of avoiding the losses which fall upon these classes of pedestrians, such as time taken for training, or reduced pedestrian movement or mobility, is also a cost made necessary primarily by the needs of the highway transportation system. The status of these persons is not of their own making; the situation suggests that, in fairness, these persons require protection and assistance.

This suggests that countermeasures to reduce losses to a majority of the pedestrians should

not be regarded in the same way as other highway safety improvements. The goal of providing protection for these classes of persons is a matter of justice more than a matter of most efficient utilization of funds.

This perspective may not apply to all pedestrians. The question of whether countermeasures applicable to pedestrians under the influence of alcohol should be treated as a responsibility of the highway transportation system, for example, is a logical one. The alcohol factor is definitely present; however, it seems less prevalent among the aged (16) and, presumably, almost nonexistent among children.

Perhaps the most relevant perspective on the propriety of countermeasures against the alcohol factor in pedestrians is that control of the drinking driver is the most heavily funded NHTSA safety program, and it will operate strongly to reduce fatalities now being incurred by drinking drivers and their passengers. (Some studies indicate more than 60 percent of alcohol-involved fatalities occur in single-car accidents which cause no loss to the nondrinking driver.)

It is still clear that more than half of the pedestrian losses occur to persons who have least active participation in highway transportation or who need protection from the risks. Society already recognizes a general obligation to the young and inexperienced by such special methods as the School Safety Patrol, Police Traffic Service programs, and many special efforts made in the fields of health and economic security to assist or safeguard older people. But the efforts for pedestrian safety deserve to be in a closer proportion to the loss, and not to be treated as competitors to safety efforts which reduce losses to highway users.

For these reasons, it is desirable to increase funds for pedestrian protection. The Highway Safety Act of 1970 has established the Highway Trust Fund as the source of two-thirds of the funds to be employed for safety research and program activity in NHTSA and FHWA, which

\*Computed from data in reference No. 3.

may include efforts for pedestrian safety. Decisions of how much of this effort is to be devoted to pedestrian safety are available to DOT.

The level of effort also appears to be limited in some areas by ignorance of what might be possible. Effects are obtainable in such fields as vehicle design, layout of streets and highways to permit pedestrian movement and to minimize conflict, and development of optimum methods for public education. These matters might greatly improve the efficiency of pedestrian safety efforts, if research to find the answers were performed. At present, not much effort is being made in vehicle design to invent some of the needed hazard countermeasures which might be possible.

### CONCLUSIONS

As a result of this study the Safety Board concludes that:

(1) Pedestrian fatalities from highway transportation constitute the largest single type of transportation fatality within the purview of the Department of Transportation other than motor vehicle occupants, and they greatly exceed the number of fatalities from all aviation, railroad, marine, and grade-crossing accidents combined.

(2) Although pedestrian safety is assisted by safety programs not specifically aimed at pedestrian losses, and a total accounting of efforts is difficult, it nevertheless appears that the pedestrian-oriented safety efforts of DOT in research, State program support, and number of Department personnel are of a level well below the proportion of pedestrian fatalities. Efforts directed specifically to pedestrian safety vary between one-eighteenth and one-ninth of the effort that would be in proportion to pedestrian fatalities. It is unlikely that side effects from other programs can account for the difference.

(3) Efforts toward pedestrian safety in DOT are found in several organizations, but no office or individual appears to be responsible for the focus or coordination of the entire effort.

(4) Interstate truck transportation produces a relatively low proportion of pedestrian fatalities,

but nevertheless the numbers of pedestrians killed in truck operations are significant in comparison with losses in other modes. There is now almost no effort toward pedestrian safety in the Bureau of Motor Carrier Safety, which is responsible for safety in interstate trucking; however, the increasing influence of BMCS regulations which are adopted by the States would justify a defined pedestrian safety effort in BMCS to reduce truck-involved pedestrian losses.

(5) A number of reasons can be advanced to explain the relatively low level of pedestrian safety effort in DOT. The most impressive apparent reason is that because of diffuseness of the field and the characteristics of persons fatally injured as pedestrians, pedestrian safety efforts based on education and enforcement would probably be less effective in saving lives than would the same amount of effort allocated to driver safety or vehicle occupant safety.

(6) Many of the pedestrians who are being killed on the highways are not active participants in highway transportation or are deserving of protection against highway risks by reason of their immaturity or advanced age. These groups suffer losses because of highway transportation, and it is proper to regard the cost of protecting them as a cost of highway transportation.

(7) Because some areas of possible pedestrian safety effort are relatively unexplored, it is possible that well-funded research and inventive efforts, more nearly commensurate with the size of the losses, might find more efficient methods of reducing losses.

(8) The absence of any organized national pedestrian interest groups and the absence of authorized programs which seek to expand facilities for pedestrian traffic or to improve the efficiency of pedestrian movement are serious drawbacks to pedestrian safety because highway safety results have often come from expansion of roads or traffic efficiency improvement efforts. There is a possibility that, in the absence of such a visible interest group, safety programs may tend to result in pedestrian traffic suppression.

## RECOMMENDATIONS

The National Transportation Safety Board recommends:

(1) That the Secretary of Transportation create an organizational responsibility (1) to insure that pedestrian safety technology and regulatory actions are routinely coordinated by NHTSA and FHWA; (2) to advise these Administrations concerning the need for facilitated pedestrian movement and pedestrian safety in relation to other program efforts; and (3) to constitute a publicly visible mechanism and expression of a continuing active interest by DOT in highway pedestrian safety.

(2) That the Secretary of Transportation seek additional funds to support pedestrian safety research and State programs responsive to the

National Highway Safety Program Standard on Pedestrian Safety. The funds to be employed for pedestrian safety research and programs should be more nearly in proportion to the numbers of pedestrian fatalities among all highway fatalities.

(3) That the Secretary of Transportation make plans for increased efforts by the National Highway Traffic Safety Administration in pedestrian safety research and development and in development of vehicle safety standards to reduce pedestrian accidents and injuries, and for increased efforts by the Federal Highway Administration in motor carrier safety regulations to reduce pedestrian accidents and injuries. Such plans should make clear what advanced forms of technical effort might be employed if specific amounts of funds were to be made available in support of pedestrian safety.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ JOHN H. REED

Chairman

/s/ OSCAR M. LAUREL

Member

/s/ FRANCIS H. McADAMS

Member

/s/ LOUIS M. THAYER

Member

/s/ ISABEL A. BURGESS

Member

May 12, 1971

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