Safety Research for a Changing Highway Environment

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By the turn of the century, many new safety features such as airbags and antilock brakes will be standard equipment on passenger vehicles, further improving the safety of motor vehicle travel. These safety features are the product of years of research and development and, in the case of airbags, of lengthy regulatory controversy over their implementation. The process of introducing safety improvements thus requires time for the benefits of improvements in saving lives and reducing injuries to be realized. Is the groundwork being laid today for the next generation of safety improvements to tackle tomorrow's safety problems?

To address this question, the Federal Highway Administration and the National Highway Traffic Safety Administration of the U.S. Department of Transportation jointly funded the Transportation Research Board to undertake a year-long Strategic Transportation Research Study for Highway Safety. The National Research Council convened a special TRB committee of 15 experts in highway safety research and management under the leadership of Ray Chamberlain, executive director of the Colorado Department of Highways, to assess the adequacy of current highway safety research programs.

The committee reached consensus on the need to rebuild programs of long-term research and recommended additional funding and changes in the management of these funds to assure more sustained support for research and an environment more conducive to innovation and scholarship. Its recommendations are contained in a report, *Safety Research for a Changing Highway Environment*, recently released by TRB.

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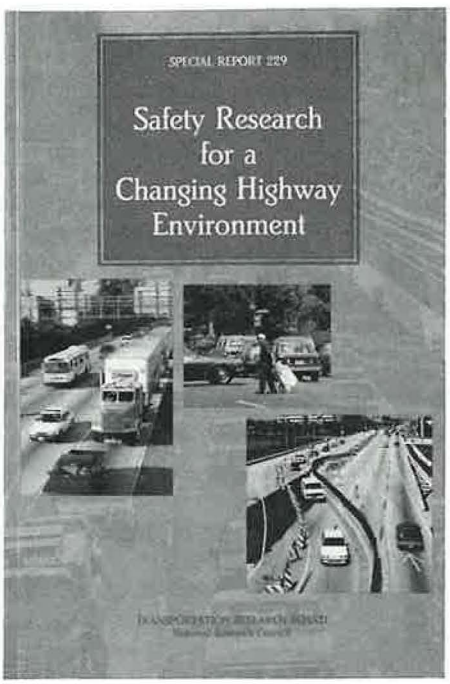

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Dimensions of the Highway Safety Problem

Motor vehicle crashes are a major public health problem. Each year traffic crashes claim about 45,000 lives, including a disproportionate share of young lives, and cause nearly 4 million injuries. In addition to the pain and suffering endured as a result of these crashes, the drain on society's resources is enormous—$70 billion (in 1986 dollars) in lost productivity, medical costs, and property damage.

The role of research is to identify, develop, and evaluate promising strategies and interventions to reduce this costly burden. During the mid-1960s, a federally funded national program of highway safety research was created to support the first federal regulation of motor vehicle safety and state highway safety programs. In the decades that followed, research sponsored by NHTSA, FHWA, the states, automobile manufacturers and suppliers, and the insurance industry laid the foundation for many advances in highway safety: the introduction of new vehicle safety features, such as seat belts and energy-absorbing steering columns; the design of more forgiving highway barrier systems and roadside hardware that breaks away on impact; enforcement strategies to deter alcohol-impaired driving; and improved emergency medical services to increase postcrash survivability. These advances have contributed to a decline in the death rate; motor vehicle fatalities per 100 million vehicle miles traveled have dropped by more than half since the mid-1960s.

Gaps in Current Research Programs

Research is vital to achieving further safety gains in a changing travel environment. If begun now, research could help prepare for emerging problems—a growing population of older drivers and pedestrians, more large-truck travel, increasing disparities in vehicle size and weight, and a more congested and aging highway infrastructure—before they become serious.

The research effort, however, has not kept pace. Over the past decade, cutbacks in federal funding have reduced support for research at NHTSA and FHWA, the primary federal sponsors of highway safety research. Federal funding averaged about $55 million annually in inflation-adjusted dollars between 1975 and 1981. Since 1981, average annual funding levels have fallen by 40 percent to about $35 million (Figure 1). State-sponsored research is spread thin. Moreover, the funds that are available are not allocated effectively for meeting long-term needs. In recent years, NHTSA and FHWA have emphasized short-term research in support of regulatory and other agency responsibilities. Many programs of long-term research have been eliminated or narrowed, reducing capacity to advance knowledge in fundamental areas such as biomechanics and human factors. Scientists trained in highway safety have left the field and new researchers are not being trained. In short, the capacity to address .emerging problems is not being developed.

Together, the federal government and the states are currently investing $70 million annually in research, less than 30 cents per capita each year. This level of spending is disproportionate to the size of the problem, the opportunity for reducing loss, and the public investment in research on other major public health problems. The nation is spending roughly 8 times as much on heart disease research and nearly 17 times as much on cancer research per year of productive work life lost (Figure 2).

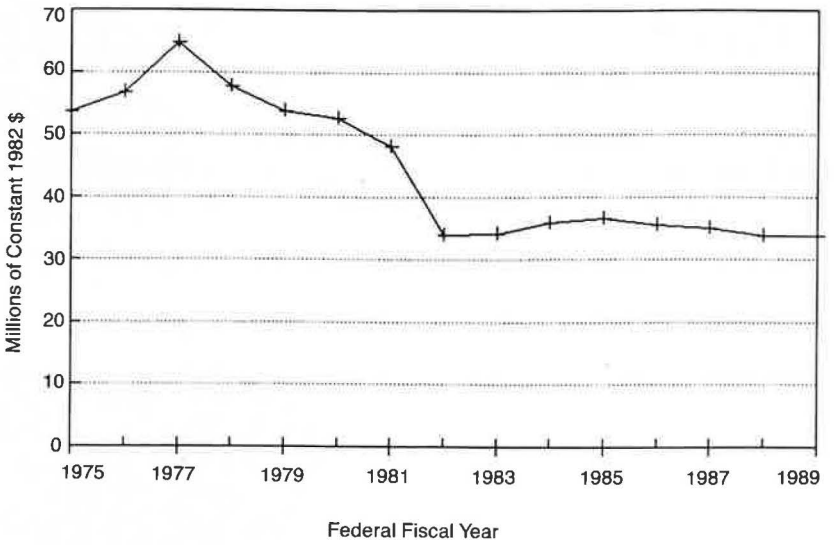

FIGURE 1 Federal support for highway safety research has waned during past decade. (Source: NHTSA, FHWA, and Centers for Disease Control.)

Research Agenda

The most pressing need is to rebuild capacity to undertake programs of long-term research. Six areas were identified in which knowledge must be advanced if emerging highway safety problems are to be tackled:

- Crash avoidance. Human error is the main cause of car and truck crashes. An expanded research program on human factors is needed to examine ways to enhance driver capabilities in increasingly complex driving conditions.
- Occupant protection. Advances in vehicle crashworthiness require an expanded program of biomechanics research on the underlying mechanisms of injury and age- and sex-related differences in human tolerance to injury.
- Highway safety design and operation. More information is needed on the costs and benefits of alternative highway design and traffic engineering improvements. In the coming decades, aging portions of the nation's highway system will have to be reconstructed, presenting opportunities to upgrade safety. Without better data, high-

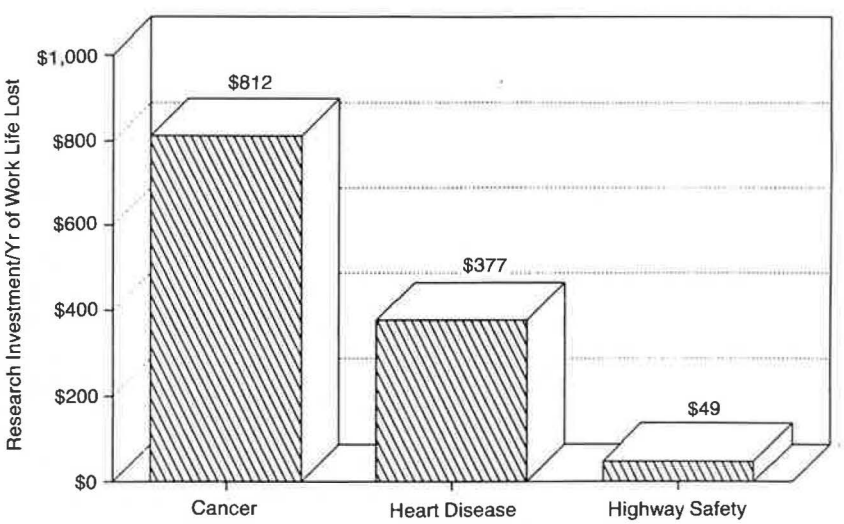

FIGURE 2 Public funding of highway safety research fares poorly relative to other major public health problems. (Source: National Cancer Institute; National Heart, Lung, and Blood Institute; NHTSA; FHWA; and Centers for Disease Control.)

Committee for Strategic Transportation Research Study: Highway Safety

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way agencies will miss opportunities for safety improvements or make safety improvements that are not cost-effective.

• Post-crash acute care and rehabilitation. To ensure continued advances in post-crash medical care, better methods should be developed to provide rapid access to crash victims on congested highways and in rural areas, identify the special needs of elderly crash victims, and address problems in health care financing for trauma centers.

• Management of highway safety. Improved methods of screening drivers and tailoring driving privileges to driver capabilities should be devised; and more efficient methods of licensing, vehicle inspection, and enforcement should be studied, including the potential for greater use of automated technologies.

• Driver information and vehicle control technologies. New technologies, such as navigational displays, are being developed to provide drivers with information about routes or congestion conditions. But how much information is too much? Studies should be undertaken to determine the potential for driver distraction and driver complacency.

Even if all of these areas were studied and countermeasures were implemented, however, major highway safety problems would likely remain. A well-structured research program must also provide for sustained research on such safety problems as substance-impaired drivers, young drivers, pedestrians, motorcyclists, and bicyclists who, despite past research and program efforts, continue to contribute a large share of the highway fatalities and injuries each year. Finally, maintenance and improvement of supporting data bases are needed.

Recommendations

To rebuild an innovative, forward-looking highway safety research program, the study committee recommended the following changes in the scale and direction of research activities:

• A more balanced portfolio of long- and short-term research, with renewed emphasis on sustained programs of research.

• Additional annual federal funding of $30 million to $40 million (in 1990 dollars), growing annually at 5 to 7 percent in real terms over the next 5 to 10 years, to provide for short-term research capacity, rebuild long-term research capability, and maintain data base support.

• Use of recommended additional resources to support a program that emphasizes peer-reviewed, investigator-initiated research; multiyear funding of research programs; more flexible funding arrangements; and education and training of new researchers.

• Enhanced DOT funding of biomechanics research, concentrated in no more than two university centers because of the high capital investment costs, to provide the knowledge base for further advances in injury reduction.

• Support for three to five university centers specializing in human factors and other highway safety research disciplines to advance the knowledge of effective crash-avoidance strategies.

• A new cooperative program for state-sponsored highway safety research to stimulate more joint state research on driver- and vehicle-related issues.

This package of recommendations should result in a level of effort more commensurate with the size of the highway safety problem. The investment should save many times its cost by providing the knowledge to make judicious decisions about safety regulations and programs and to realize the full potential for saving lives and dollars.