

SPECIAL

REPORT

289

Building the Road Safety Profession in the Public Sector

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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Committee for a Study of Supply and Demand for
Highway Safety Professionals in the Public Sector

TRANSPORTATION RESEARCH BOARD
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Preface

In April 2002, the Federal Highway Administration's (FHWA's) Office of Safety hosted a workshop in San Antonio, Texas, to discuss topics related to workforce development for the road safety community. The workshop was cosponsored by the Institute of Transportation Engineers, the Transportation Research Board (TRB), and the American Association of State Highway and Transportation Officials. Its purpose was to identify strategies for building the supply of road safety professionals and to inform elected officials and other decision makers about the important role of the road safety profession. Workshop participants discussed the importance of providing resources for the training and education of road safety professionals, ensuring that ample opportunities exist for comprehensive safety education and training, and creating incentives for safety to be given careful and explicit consideration in all decisions and actions that can affect road safety performance.¹

To further the ideas and goals of the San Antonio workshop, TRB created the Task Force on Road Safety Workforce Development.² It had several purposes: to raise awareness of the need for education and training opportunities for road safety professionals; develop a set of core competencies for the road safety professional; and encourage their use in training and education programs, hiring decisions, performance evaluations, and professional development. Importantly, the task force was created to offer a regular meeting place for road safety experts and officials from federal agencies, national associations, state and local agen-

¹ See http://safety.fhwa.dot.gov/media/pdf/proc_hswpw.pdf.

² The task force was originally created as the Joint Subcommittee on Highway Workforce Development.

cies, and universities and research institutions. One of the task force's first actions was to aid in the development of a statement of core competencies for the road safety profession. Another was to secure the commitment and resources required for a TRB study of road safety professionals in the public sector.

FHWA, the Federal Motor Carrier Safety Administration (FMCSA), and TRB provided \$150,000, \$75,000, and \$75,000, respectively, for TRB to convene a study committee to examine the supply of and demand for experts in road safety. In accordance with the usual National Research Council (NRC) procedures, TRB assembled a committee with a range of expertise in transportation and motor vehicle safety administration; transportation research, education, and training; and safety needs, evaluation, and program development. The study committee was charged with drawing on available data and literature, as well as the results of a workshop, to examine the current and expected future supply of and demand for experts in safety program administration, research, and evaluation; to examine evidence regarding the concern about current and future shortages of safety professionals; and if such shortages are found or appear likely to emerge, to identify probable causes and recommend means of addressing them.

There is growing concern that efforts to improve road safety are not keeping pace with growth in motor vehicle travel and that continued improvement in safety will require more road safety experts capable of applying more rigorous scientific and systems approaches to safety management. The committee, therefore, was expected to take a forward-looking approach to the study, considering how the demand for road safety professionals is changing and what steps can be taken to ensure that the supply of these workers keeps pace with growing and changing demands. The full Statement of Task for the study is presented in Box P-1.

Under the leadership of Kam K. Movassaghi, the 11-member committee met three times during a 1-year period. Early in its deliberations, the committee learned that data and literature on the road safety workforce and profession are limited. As a consequence, it held a workshop in conjunction with its second meeting on August 10–11, 2006, to obtain firsthand information concerning the factors influencing the supply

BOX P-1

Statement of Task

This project will examine the current and possible future supply of and demand for experts in highway safety program administration, engineering, research, and evaluation. It will hold a workshop and examine evidence regarding the concern about knowledge gaps and current and future shortages of highway safety professionals. The committee will draw upon any literature, data, and the workshop results to

- Describe portions of the national workforce currently involved in road safety and provide rough estimates of their number;
- Describe portions of the national transportation agency workforce whose skills or roles will be used or should be employed in reducing crashes, injuries, and fatalities;
- Describe the existing skills of road safety professionals;
- Describe the kinds of expertise and types of road safety professionals likely to be needed in the future;
- Identify the current mechanisms for educating and training safety professionals;
- Describe existing training and educational gaps for developing professionals; and
- Identify likely causes of shortages in knowledge, training, and educational programs that are described above.

Because of the expected gaps in empirical evidence about the nature and extent of the problem, this project will rely heavily on a workshop designed to draw on the judgment of existing professionals, educators, and employers of highway safety professionals. It is expected that the workshop will draw on and be designed around the current survey of educational programs and description of core competencies being developed by a voluntary task force of safety professionals.

of and demand for road safety professionals. Seventeen guest panelists participated in the workshop, which included panels of experts in road safety management, education and training, human resources, and agency administration (see Appendix A for the meeting agenda).

The panel discussions were highly informative and influential. The committee learned a great deal about how safety professionals are educated, trained, recruited, and hired. During the course of its study, the committee also benefited from the publication of *NCHRP Research Results Digest 302: Core Competencies for Highway Safety Professionals*, which included the results of a survey of university highway safety education opportunities. The information and insights gleaned from this document and from the workshop were referred to repeatedly by the committee during its deliberations and the drafting of this report.

The report concludes with a series of recommendations that are aimed at building the road safety profession through the cooperative efforts of the many organizations that educate, train, accredit, and hire road safety professionals.

ACKNOWLEDGMENTS

During its information-gathering sessions, which were open to the public, the committee was briefed by representatives of the two U.S. Department of Transportation agencies that sponsored the study. The committee thanks Michael Halladay, Michael Trentacoste, and Ben Gribbon of FHWA and Alex Keenan of FMCSA for explaining the study charge and their agencies' expectations for the project. Mr. Gribbon was especially helpful as FHWA's main liaison to the committee. The committee benefited from his active participation and support throughout the course of the study.

Thanks are also due to all who participated in panel sessions during the committee's August 2006 workshop: Tom Bryer, Pennsylvania Department of Transportation (retired); James Champagne, Louisiana Governor's Highway Safety Representative; Frank Cardimen, Traffic Improvement Association of Oakland County, Michigan; Ann Dellinger, Centers for Disease Control and Prevention; Hugh McGee, Vanasse Hangen Brustlin, Inc.; Alexander Weiss, Center for Public Safety, North-

western University; David Ragland, University of California Traffic Safety Center; Jackie Milani, Center for Injury Research and Policy, Johns Hopkins University; Lindsay Griffin, Texas Transportation Institute (retired); Shirley Licorish, Cambridge Systematics; Rick Barnaby, National Highway Institute of FHWA; Kate Immordino, New Jersey Department of Transportation; Pete Rahn, Missouri Department of Transportation; Charlie Howard, Puget Sound Regional Council; Alexander Kelter, California Department of Health Services (retired); Marilena Amoni, National Highway Traffic Safety Administration; and Keith Magnusson, North Dakota Department of Transportation.

Thomas R. Menzies, Jr., managed the study and drafted the report under the guidance of the committee and the supervision of Stephen R. Godwin, Director of Studies and Special Programs at TRB. Richard F. Pain, TRB's Transportation Safety Coordinator, served as liaison for TRB's Technical Activities Division.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise in accordance with procedures approved by NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making the report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

The committee thanks the following individuals for their review of this report: David L. Harkey, University of North Carolina at Chapel Hill; Herbert S. Levinson, Herbert S. Levinson Consultant; Martin E. Lipinski, University of Memphis; Michael D. Meyer, Georgia Institute of Technology; Michael L. Prince, Michigan State Police; George Ostensen, FHWA (retired); and Terecia W. Wilson, South Carolina Department of Transportation. Although the reviewers provided many constructive comments and suggestions, they were not asked to endorse the committee's findings, conclusions, or recommendations, nor did they see the final draft before its release. The review of this report was overseen by Lester A. Hoel, University of Virginia. Appointed by NRC, he was responsible for making certain that an independent examination of this re-

port was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of the report rests solely with the authoring committee and the institution.

Suzanne Schneider, Associate Executive Director, TRB, managed the report review process. The report was edited and prepared for publication by Norman Solomon, Senior Editor, TRB; and the prepublication files for posting to the TRB website were formatted and prepared by Jennifer J. Weeks, Editorial Services Specialist, TRB, under the supervision of Javy Awan, Director of Publications, TRB. Special thanks go to Amelia Mathis, Administrative Assistant, TRB, for providing the significant amount of administrative support required in holding the workshop and committee meetings.

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Summary

More than 40,000 people die each year in motor vehicle crashes in the United States, and many more are seriously injured. Reducing this toll is a major goal of governments at all levels. Since the 1960s, the number of fatalities per mile driven has fallen by 75 percent owing to a combination of public and private actions to improve driver performance, motor vehicles, the highway environment, and postcrash emergency response and medical care. As a result, thousands of deaths and millions of injuries have been prevented. Nevertheless, the consequences of motor vehicle crashes continue to be a major public health problem and the leading cause of death among children and young adults. Continued growth in motor vehicle travel means that larger and larger improvements in crash rates are needed to produce any reduction in the total number of people killed and injured in crashes each year. Yet improvements in crash rates in the United States have been lagging behind those of many other developed countries.

The public sector must lead in the search for ways to improve road safety. Federal, state, and local government agencies plan, finance, build, operate, and maintain the nation's highway system. They regulate motor vehicle safety requirements and educate and license drivers. They set and enforce traffic laws and provide emergency response and medical services. They collect safety data and conduct and support safety-related research. Few aspects of road safety are not directly influenced by government policies and programs.

Thousands of public agencies carry out these safety-related tasks. Together they employ hundreds of thousands of workers who have responsibilities that affect road safety. Approximately 100,000 of these workers have responsibilities that affect road safety on a regular basis,

and nearly 10,000 of them spend all or most of their workday managing road safety. However narrowly or broadly one defines the safety workforce, it is aptly described as dispersed and diverse. It is spread across the country in all levels of government. It encompasses expertise and occupations in such fields as engineering, education, law enforcement, emergency response, public health, psychology, communications, statistics, and planning.

To a large extent, the discussion and advice in this report pertain to the roughly 10,000 public-sector employees who work full-time on road safety. However, the desired outcome is that all 100,000 workers who influence road safety come to possess safety-related knowledge derived from science and a systems view of safety that recognizes the interrelated roles of drivers, vehicles, and the highway environment, including the physical infrastructure and nonmotorized users. A knowledgeable and skilled nucleus of full-time road safety professionals is crucial to this outcome. As the safety mentors to the larger workforce, they must lead in bringing about a scientific and systems-level approach to safety management.

This report describes the road safety profession, observing how it has evolved over the past 50 years to encompass experts from many disciplines. It further describes how a dedicated cadre of these experts has brought with them a shared belief that empirical evidence and scientific methods are essential in understanding road safety problems and in finding, implementing, and evaluating solutions. Informed by previous studies and by the committee's interviews with road safety professionals, educators, trainers, human resource managers, and agency executives, the report describes how these experts have found their way into the road safety field, how they received their safety-related education and training, and the kinds of safety-related knowledge and skills they possess. A key finding is that the building of the road safety profession has been a largely ad hoc and unstructured process. Core safety knowledge and skills are often obtained on the job, if they are obtained at all. Few universities offer a systems-level road safety curriculum, and there are few places where public agencies can recruit trained safety professionals.

This finding is disconcerting because it calls into question the ability of government agencies to meet the public's expectations for con-

tinued improvements in road safety. There is little doubt that the scale and complexity of the road safety problem will require an increasingly rigorous and systematic approach to safety management that is carried out by a highly skilled, analytical, and multidisciplinary safety workforce. A number of factors cited in the report suggest that the demand for such a skilled workforce is growing—for example, to apply new safety-related tools and technologies and to meet legislative mandates for data-driven safety programs. The demand for safety professionals threatens to outpace the ability of public agencies to attract interested and talented workers to the field and to educate and train them to perform effectively.

Rising demand for road safety professionals is, of course, desirable. It reflects the recognition that safety gains are not random occurrences but a consequence of well-informed and well-implemented decisions. The challenge, therefore, is in building the pool of safety professionals who can provide this information and expertise for the thousands of public agencies with road safety responsibilities.

Critical to meeting this challenge is a recognition that workforce development takes time, and therefore it is not too early to act. The recommendations below stem from this recognition. They are made in the knowledge that a series of steps, large and small, will be required to nurture and build the road safety profession and that a champion to advocate for the profession will help ensure that these steps are taken sooner and bear fruit more quickly.

RECOMMENDATIONS

State Associations Should Forge a Broad-Based Alliance to Advance the Road Safety Profession

To a greater extent than any other level of government, states have responsibilities that affect all aspects of road safety. They plan, design, build, operate, and maintain large portions of the highway infrastructure; pass and enforce traffic safety laws; regulate driver instruction and licensing; and administer statewide programs aimed at encouraging safe driving behavior. Given the scope of these responsibilities, states employ thousands

of road safety professionals and must therefore play a central role in any effort to build this discipline.

The two national associations whose state members are responsible for many of these safety-related functions are the American Association of State Highway and Transportation Officials (AASHTO) and the Governors Highway Safety Association (GHSA). Because collaboration is crucial in building the multidisciplinary road safety profession, **the committee urges AASHTO and GHSA to forge a broad-based alliance of safety-related organizations for the central purpose of advancing the road safety workforce and profession.** The alliance should include the many public agencies, associations, and professional societies with a strong interest in road safety and should have representatives from the many relevant fields and jurisdictional levels. Federal participants should include the Federal Highway Administration, the National Highway Traffic Safety Administration, the Federal Motor Carrier Safety Administration, and the Centers for Disease Control and Prevention (CDC). Other state and local government agencies may be well represented by their national associations, such as the American Association of Motor Vehicle Administrators, the American Association of Metropolitan Planning Organizations, the National Association of Regional Councils, the National Association of County Engineers, the American Public Works Association, the International Association of Chiefs of Police, and the Commercial Vehicle Safety Alliance. The participation of national associations of local governments is especially important because of the role of counties, municipalities, and towns in ensuring road safety.

The alliance should likewise seek the support of private-sector organizations, universities, and professional associations that have a common interest in building the road safety workforce. Participation by professional societies and educational and research institutions, such as the Institute of Transportation Engineers, the American Society of Civil Engineers and its Transportation and Development Institute, the American Society of Safety Engineers, the Council of University Transportation Centers, the American Planning Association, the Human Factors and Ergonomics Society, and the Society for Advancement of Violence and Injury Research, is highly desirable.

The Alliance Should Champion the Road Safety Profession on Multiple Fronts

The committee envisions an alliance whose goals are both practical and ambitious. The alliance's activities and actions will help meet current workforce needs while advancing the profession over the longer term. In particular, the committee envisions an alliance that will do the following:

- Promote a multidisciplinary safety workforce that recognizes the importance of and is capable of applying a science-based and systems-level approach to safety management.
- Commend and publicize public agencies that are leading the way in recruiting, developing, and building a professional road safety workforce within their organizations. Promote the methods used by such agencies to foster these outcomes.
- Encourage the continued development and wider use of core competency definitions to guide the education, training, and promotion of road safety professionals who are skilled in scientific methods and in pursuing safety solutions from a systems level.
- Promote road safety management as a distinct profession and a desirable career path.
- Persuade public agencies, industry, and universities of the value of forming road safety education and training partnerships, which can help foster demand for road safety training and education and expose road safety professionals to the methods and results of science-based safety research.
- Advocate support for science-based safety research to inform road safety professionals and to attract top faculty and students to the road safety field from many disciplines—for example, by seeking the creation of scholarships, internships, training grants, endowed university chairs, and research centers across the many disciplines that contribute to road safety.

Taken together, such actions should help foster recognition among the public and public officials that a skilled and professional road safety workforce is valuable and necessary. This recognition is essential in sustaining the long-term support needed to build such a workforce.

Early Opportunities for Alliance Support and Action

The alliance should urge states to take advantage of federal workforce training funds for the purpose of developing road safety professionals. Federal legislation has raised the stature of road safety by calling on states to engage in strategic safety planning and use analytic approaches to safety management. To do so, states will need a skilled road safety workforce. Currently, states are allowed to use federal funds for workforce training and other educational activities; however, there are no federal directives or guidance with regard to the use of these funds for safety-related training. While such guidance may not be required, the alliance can bring greater attention to the need for education and training of road safety professionals and encourage states to devote sufficient resources for this purpose.

The alliance should advocate road safety education and training by universities, including the publicly funded research centers. Road safety education and training opportunities are highly fragmented, seldom in the form of a comprehensive program covering the many competencies required by road safety professionals. While many universities have strong safety research programs, fewer have instructional programs tied to this research. An increased emphasis on coupling research with technology transfer, education, and training is desirable because it can expose safety professionals to the methods and results of science-based research. For example, the committee observes that University Transportation Centers, which receive funding from the U.S. Department of Transportation, and Injury Control Research Centers, which receive funding from CDC, are well positioned to play stronger roles in road safety education and training. In general, the alliance should be a prominent and persistent advocate for comprehensive road safety instruction by universities and other relevant education, training, and research institutions.

The alliance should explore the creation of one or more specialized institutes to provide comprehensive instruction and training for road safety professionals. The modest number of road safety professionals in any one agency or state may reduce the practicality of creating comprehensive road safety education and training programs in individual states or regions of the country. In addition, the multidisciplinary nature of the road safety profession presents practical challenges for both traditional

university-based education programs, which are often housed in engineering or public health departments, and federal training programs, which are often designed for specific functions such as administering a safety grant program. However, the number of road safety professionals at the national level is sizable. Accordingly, the alliance should explore the need for and ways to provide training and education through existing programs or through the establishment of new programs dedicated to the road safety profession.

CONCLUDING OBSERVATION

The demand for improvements in road safety is growing but becoming increasingly difficult to meet. Road safety must be viewed as an area of scientific inquiry requiring comprehensive and systems-level solutions. As science-based and systems-level safety programs become more common at the federal, state, and local levels, a skilled and knowledgeable road safety workforce is needed to develop, inform, and implement them. By working together, road safety organizations can call attention to this workforce need and take actions to help meet it. While building the road safety workforce will take time, many steps to start the process can be taken now.

Introduction and Overview

The road safety workforce in the public sector is dispersed among thousands of federal, state, and local agencies whose responsibilities range from crash prevention and mitigation to the provision of emergency services. Many factors contribute to crashes and their severity, and many government agencies and workers have important safety-related roles and responsibilities. Hence, the road safety workforce not only spans all levels of government but also encompasses a diversity of expertise in fields such as engineering, research, education, psychology, law enforcement, and public health.

STUDY AIMS

This study describes the dispersed and diverse road safety workforce and the safety-related knowledge and skills its workers must possess. Continued growth in motor vehicle travel means that progress in reducing the number of people killed and injured in motor vehicle crashes is becoming increasingly difficult. Progress requires rigorous application of scientific and systems-level approaches to safety management by well-educated and well-trained safety experts. For example, the “safe system” approach seeks to identify and address all major factors affecting the incidence and severity of specific crash types, such as the driver, the vehicle, the roadway environment, and emergency response services. It places a priority on prevention through understanding these factors and addressing them through countermeasures that are evaluated repeatedly for effectiveness. Such a comprehensive approach requires road safety experts with a wide range of knowledge and skills from many disciplines. A key objective of the study is to gain a better understanding of the

knowledge and skills required by road safety professionals, how this expertise is obtained, and how it is applied by the thousands of workers in the public sector who contribute to road safety on a regular basis. The goal is to advise on steps that can be taken to ensure a timely and sufficient supply of skilled road safety professionals to meet the growing demand for improved road safety. While a larger workforce may be needed to meet future safety challenges, this report focuses on addressing the development of a high-quality workforce.

STUDY GENESIS AND APPROACH

As explained in the Preface, this study stems from a long-standing concern about the availability of education and training opportunities for current and aspiring road safety professionals. For the past several years, the interdisciplinary Transportation Research Board (TRB) Task Force on Road Safety Workforce Development has observed that many of the professionals drawn into the road safety field are nearing retirement. The lack of young professionals to replace them is a common problem, and the means of educating and recruiting future highway safety professionals is perceived to be inadequate to meet future needs (Hauer 2005).

The TRB task force surveyed the educational programs being offered students and road safety professionals and assisted in the development of a set of “core competencies for highway safety professionals” (TRB 2006) intended to provide the foundation of baseline knowledge for road safety education and professional development. In doing so, the task force members realized that encouraging government and academe to take the competencies into account is only a precursor to meeting the future demand for road safety professionals. Development of a larger and better-trained safety workforce requires that policy makers at all levels of government recognize the critical role and needs of this profession and take concerted actions. The task force therefore urged the undertaking of and was instrumental in obtaining sponsorship for this study of the future supply of and demand for road safety professionals.

The study focuses on the public-sector workforce because ensuring road safety is a major responsibility of government at all jurisdictional

levels. The public agencies, for example, set policy and control the funds to build and improve roadways, administer driver licensing regulations, enforce the rules of the road, and provide emergency response services. Of course, the road safety workforce extends well beyond the public sector to include the many private and not-for-profit organizations that have central roles in safety, including automobile manufacturers, fleet operators, highway equipment suppliers, and advocacy and consumer groups such as Mothers Against Drunk Driving and AAA. Public agencies increasingly rely on private contractors and consultants for work assignments, including safety-related functions, that were once performed by agency staff. Road safety expertise is therefore needed in the expanding contractor and consultant workforces. Road safety experts must likewise populate the faculty and staff of universities, training centers, and research institutions. The public workforce is thus a key part of a much broader workforce and volunteer community that is responsible for road safety. Developing the public-sector road safety workforce is a start to building the road safety profession generally, and it must be accompanied by efforts to educate and train this larger workforce.

Transportation workforce issues are complex and have been studied in other TRB reports, including *TRB Special Report 275: The Workforce Challenge: Recruiting, Training, and Retaining Qualified Workers for Transportation and Transit Agencies* (TRB 2003). One issue is the effect of agency budgetary cutbacks and worker retirements on the size and quality of the transportation workforce generally, particularly in the road safety field. Estimates of the number of road safety workers made in this report are but a snapshot in time and not indicative of longer-term trends in the size of the road safety workforce. Such trends are difficult to predict because they are influenced by many of the same factors affecting growth in the public-sector workforce in general (e.g., budgetary cutbacks, the contracting out of services, demographic factors). With regard to the quality of the road safety workforce, however, the retirement of workers entering the road safety field during the 1960s and 1970s is certain to present a significant challenge to public agencies.

Marshalling even the most basic statistics on the scale, scope, and character of the road safety profession proved to be a difficult task

because of the dispersed nature of the workforce. Except for the efforts of the TRB task force, the road safety profession has received little attention in the literature since passage of landmark highway safety legislation during the 1960s. Hence, in conducting the study, the committee had to extrapolate and make rough estimates of the workforce on the basis of limited data and the expert judgment of committee members. The committee generated information through its own fact-finding activities, including the convening of a workshop consisting of panels of experts in road safety management, research, education, human resources, and public administration (see Appendix A for a list of panelists). The firsthand information and insights gained from the workshop were invaluable to the committee as it drew conclusions and developed recommendations.

REPORT ORGANIZATION

Since the invention of the automobile, state and local governments have viewed motor vehicle crashes as a public safety concern that warranted government attention and intervention. The degree and nature of government involvement have varied over the years for many reasons, including changes in the severity of the problem and understanding of the factors that contribute to crashes. The federal government's involvement, in particular, became much more prominent in the 1960s, as policy makers responded to the marked (50 percent) increase in the number of people killed in motor vehicle crashes during that decade.

Chapters 2 and 3 describe the history of government involvement in road safety and the evolution of the road safety profession over the past half century. Marked growth in motor vehicle travel after World War II was accompanied by increasing numbers of highway deaths, which prompted more systematic and scientific approaches to crash prevention and mitigation. While expertise in traffic engineering and law enforcement was predominant, increasing numbers of experts were drawn into the road safety profession from disciplines ranging from psychology and human factors to statistics and communications. New public agencies

were created with road safety responsibilities at all levels of government, while many existing agencies—such as state highway departments—were given explicit safety missions.

The dimensions of the road safety problem, past and present, are described in these chapters. The magnitude of the problem makes clear why thousands of agencies at the federal, state, and local levels have critical safety responsibilities. The responsibilities are described, and the size of the road safety workforce is estimated. It is likely that many of the workers included in the estimates do not view themselves as safety professionals even though they are employed by agencies with explicit safety missions and have responsibilities with a direct bearing on road safety performance.

The concept of a profession implies a set of workers sharing a body of knowledge and skills. Chapter 4 describes the body of knowledge and the basic sets of skills and competencies that are required by road safety professionals. *NCHRP Research Results Digest 302: Core Competencies for Highway Safety Professionals* (TRB 2006) outlines the basic safety-related knowledge and skills that all road safety professionals should possess. It covers five core areas of competency and specific learning objectives for each. The core competencies are reviewed in that chapter and summarized in Appendix B.

Chapter 4 also examines the coverage of the core competencies in programs to educate and train transportation and public safety professionals. The chapter indicates that there are many possible avenues for the core knowledge and skills to be acquired but few that are comprehensive and guided by the overarching concept of a distinct road safety profession. Chapter 4 concludes with a brief review of road safety research activities, which are instrumental in providing factual knowledge for the safety profession and attracting students and young professionals to the field.

Chapter 5 focuses on the future of the road safety workforce and the opportunities for developing a more professional workforce. The committee summarizes the key findings in the report, draws conclusions from them, and recommends measures aimed at building and advancing the road safety profession.

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Abbreviation

TRB Transportation Research Board

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The Safety Challenge and the Public-Sector Role

The dimensions of the road safety problem in the United States are described in this chapter. The magnitude and persistence of the problem explain why road safety is a concern for nearly all Americans and a major challenge for government at all jurisdictional levels. The many kinds of federal, state, and local agencies with a meaningful role in road safety are identified. Although a detailed description of their roles and responsibilities is not possible, the key legislation, programs, and policies that have come to shape the public sector's influence on road safety are discussed.

DIMENSIONS OF THE ROAD SAFETY PROBLEM

In 2005, 43,443 people were killed in motor vehicle crashes in the United States. Another 2.7 million were injured (NHTSA 2006b). Motor vehicle crashes are the leading cause of injuries and the sixth leading cause of death in the United States. They are the single largest cause of death, by a wide margin, for people aged 4 to 33. Two of every five deaths among teenagers result from motor vehicle crashes (CDC 2004). The number of lives lost in motor vehicle crashes over long periods is staggering. Since 1980, more than 1.1 million people have died in motor vehicle crashes in the United States. Half of those killed were under the age of 35. If current rates continue, more than 100,000 adolescents and young adults aged 16 to 24 will die in crashes during the next decade (Winston and Senserrick 2006).

Given the current scope and scale of the road safety problem, it is almost unimaginable that 40 years ago many more people died on the nation's roadways—about 10,000 more per year. In 1966, when there were half as many licensed drivers as today and 60 percent fewer registered

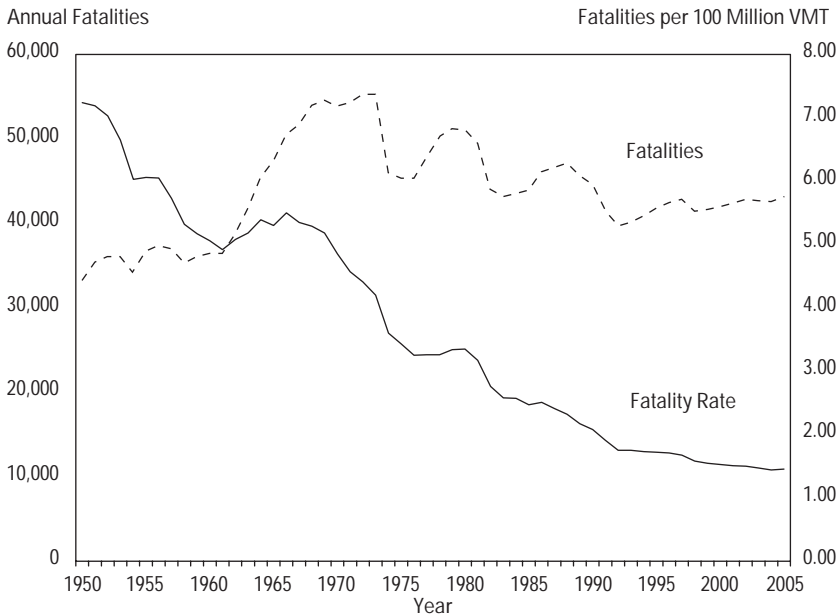


FIGURE 2-1 U.S. motor vehicle crash fatality trends, 1950 to 2005 (VMT = vehicle miles traveled). (Source: FHWA *Highway Statistics* annual publications.)

vehicles, the number of fatalities per mile traveled was three to four times higher (FHWA 1976). During the 1960s, the number of people killed in motor vehicle crashes rose from 36,000 to 55,000 per year, an increase of 50 percent (Figure 2-1).

As the 1960s proceeded, concern over the death toll sparked major changes in the roles and relationships of the federal, state, and local governments with respect to road safety. For the first 50 years of motor vehicle use in the United States, the public sector concerned itself mainly with providing orderly and accessible roads and regulating driver skills and compliance with traffic rules. State and local governments took the lead through the setting and enforcing of traffic laws, driver licensing standards, and vehicle safety inspection requirements. By the end of the 1960s, however, the federal government had assumed a much more prominent and comprehensive role. It had established dozens of new regulations governing the safety features of new vehicles, sponsored multi-

year research projects to improve highway safety designs and features, and provided hundreds of millions of dollars in aid to support state and local safety programs in such areas as pedestrian safety, driver training, and the provision of emergency medical services.

The fatality rate declined faster than growth in motor vehicle travel, and the annual number of fatalities dropped below 50,000 for the first time in 10 years by the middle of the 1970s (FHWA 1976). The improvements were rightly viewed as indicative of the important role that public policy could play in mitigating the safety problem. During the next three decades, many additional actions were taken at the federal, state, and local levels to improve safety. As a prerequisite for receiving federal highway aid, states raised their minimum drinking ages to 21 and began to adopt stricter standards for impaired driving and tougher sanctions on violators. Improvements in detecting the use of alcohol by drivers and a more objective testing-based system of traffic laws followed suit (TRB 1987). Alcohol use, estimated to be responsible for 54 percent of motor vehicle deaths in 1982, accounted for 39 percent in 2005 (NHTSA 2006b). Evans (2004, 251) estimates that a reduction in drunk driving has led to 15,000 fewer deaths per year than would have occurred if measures to discourage this behavior had not been taken.

Through the combined efforts of the automotive industry and the federal government, motor vehicles became more survivable and forgiving to occupants in a crash. Citing National Highway Traffic Safety Administration (NHTSA) studies and data, Evans (2004, 144) calculates that the five most effective vehicle safety features required by NHTSA (apart from the requirements governing safety belt installation) have reduced occupant fatality risk by about 10 percent.¹ He further estimates that the combined effect of all of the NHTSA motor vehicle safety standards has been to reduce occupant fatality risk by 15 to 20 percent (Evans 2004, 117).

NHTSA estimates that wearing a safety belt reduces a driver's risk of being killed in a crash by 45 percent (NHTSA 2006a). Since the early 1970s, passenger safety belt use has increased from less than 25 percent to more than 80 percent, after campaigns to promote safety belt use and

¹ The five features are energy-absorbing steering columns, more forgiving and better-located instrument panels, side door beams, door locks, and roof crush resistance.

the enactment of laws mandating their use in many states starting in the mid-1980s (NHTSA 2006a). According to Evans (2004, 295–304), states that have passed safety belt laws increased driver and passenger usage levels by a median of 33 percent, resulting in a 9 percent median reduction in fatalities. NHTSA estimates that safety belts and child safety seats have saved more than 220,000 lives since 1975 (NHTSA 2006b).

Over the past 40 years, the highway environment itself has undergone changes benefiting safety. In 1966, half of all driving took place on rural roads (FHWA 1976). Today, rural roads account for only 37 percent, while urban roads account for 63 percent. In part this is because some roads were reclassified as urban, but the main reason is the growth in metropolitan populations (FHWA 2005a). For a number of reasons, including slower travel speeds, the fatality rate per mile driven on urban roads is 60 percent lower than on rural roads (FHWA 2005a). Hence, the changing pattern of travel from rural to urban roads has accounted for a significant portion (about 10 percent) of the decline in the fatality rate. Much of the growth in urban travel has occurred on Interstate highways, which are designed to the highest safety standards and have the lowest fatality rate per mile of travel. Today, the nation's urban Interstates account for 15 percent of all miles traveled, compared with only 6 percent 40 years ago (FHWA 1976; FHWA 2005a).

Finally, many improvements have taken place in emergency response and medical services, which have undoubtedly contributed to a decline in the crash fatality rate. Among the important response capabilities and services introduced during the past 30 years are the “jaws of life” extraction tool, regional trauma care centers, air ambulance services, and 911 coverage, which has been made even more effective by the proliferation of cell phones.

THE ONGOING SAFETY CHALLENGE

Many of the improvements in road safety over the past 30 to 40 years were spurred by an array of government programs and policies. The number of people killed in motor vehicle crashes peaked at 55,704 in 1972 (FHWA 1976). That year there were 4.4 fatalities for every 100 million vehicle miles traveled, which is nearly three times higher than the current rate. Today's fatality rate is 1.47 deaths per 100 million vehicle miles

traveled (NHTSA 2006b). Had the fatality rate not fallen so sharply—in part because of the many actions taken by government—one would expect hundreds of thousands of additional lives to have been lost during this period.

Despite the impressive safety gains that have been made over time, motor vehicle crashes remain a main cause of death and injury in the United States and the leading cause of death among children (CDC 2005). Furthermore, the crash fatality rate has changed very little during the past decade. Evans maintains that safety gains made in many other developed countries during the past three decades have exceeded those in the United States by a wide margin. He estimates that during the 23 years from 1979 to 2002, the United States would have experienced about 200,000 fewer fatalities if its vehicle fatality rate had declined each year by the same percentage that it did in Great Britain, Canada, and Australia (Evans 2004, 387). Unless the vehicle fatality rate can be lowered further, total fatalities will again begin to trend upward as motor vehicle travel rises.

Both the federal government [NHTSA, the Federal Highway Administration (FHWA), and the U.S. Department of Transportation (USDOT)] and state officials [the American Association of State Highway and Transportation Officials (AASHTO), the American Association of Motor Vehicle Administrators, and the Governors Highway Safety Association] have established the goal of reducing the fatality rate to less than 1 death per 100 million vehicle miles traveled by 2010 (AASHTO 2005). Whether this safety goal can be achieved during the envisioned time frame, or even over a less ambitious period of time, will depend on a number of factors. Among them are

- Social, economic, and demographic trends, including the safety impacts arising from an increasing population of older drivers and the ability to make timely changes in highway signing and lighting, driver licensing standards, and vehicle crash avoidance and protection capabilities;
- Changes in the mix of motor vehicle sizes and types (e.g., trucks, SUVs, motorcycles), which will be influenced by many factors, including changing consumer preferences, fluctuating energy prices, freight traffic, and the development and mass introduction of new vehicle technologies;

- The uncertain social, legislative, and judicial responses to future safety measures aimed at curbing risky driver behaviors, as evidenced by the difficulties experienced over the years in implementing driver-oriented safety measures such as primary safety belt laws, automated (photo) enforcement aimed at speeding and red-light running, and sobriety checkpoints;
- The continued influx of personal and in-vehicle technologies that affect (positively and negatively) driver attentiveness, awareness, and driving capabilities; and
- The progression toward a safety “culture” as indicated by the public’s demand for and willingness to accept more concerted measures to bring about safe driving behavior.

The experience of the past 40 years suggests the need for a multi-pronged approach to improving highway safety—one that is systematic in addressing the array of factors affecting crash incidence and severity. Evans (2004, 381) notes that the United States was once the world leader in highway safety. In 1960, it had the lowest fatality rate per mile of travel in the industrialized world. Today, many industrialized countries have lower rates, including Canada, the Netherlands, Sweden, Australia, Japan, and Great Britain (Evans 2004, 382). Evans considers some of the reasons for this loss in status. He concludes that an unbalanced emphasis in the United States on crash protection and a reluctance to adopt laws that require safety belt use, curb drunk driving, and dissuade other risky driving behaviors were major causes. He acknowledges the critical importance of the public sector in ensuring safety, maintaining that public policies have failed to address the main behavioral factors influencing safety performance.

The cause of the safety improvements in other industrialized nations is often attributed to the adoption of a more comprehensive “safe system” approach to road safety. These nations have set clear performance goals for safety improvements and pursued them through combinations of means that target the driver, the vehicle, and the roadway and that are implemented by multidisciplinary teams (FHWA 2005b). Such an approach has implications for the quality of the road safety workforce. For example, it would require greater expertise in a wider array of disciplines. It can affect the composition and size of the workforce over the

long term in other ways, depending on how effective it is in bringing about the desired safety improvements. The safe system approach is an important concept with implications for the education and training requirements of road safety professionals.

ROAD SAFETY RESPONSIBILITIES OF GOVERNMENT

In comparing U.S. motor vehicle safety experience and policies with those of other countries, the differences in the political and institutional settings of the countries stand out. One obvious difference between the United States and Great Britain, for example, is the structure of governance. In Great Britain, nearly all government functions pertaining to road safety are handled at the national level. The federal system in the United States has led to a much more decentralized set of decision-making bodies and implementing institutions, spanning several branches and agencies of the federal government; the 50 states and the District of Columbia; and thousands of counties, municipalities, townships, and other local governmental bodies. Not only are road safety functions scattered across jurisdictional levels, they are further dispersed among multiple institutions with safety responsibilities at each level of government, as described below.

Federal Government

The U.S. Congress passes laws and appropriates funds for programs that have major impacts on highway safety. The laws and programs are administered by several federal agencies, often in the form of regulations, grants to states and local authorities, and technical information and advice. Although highway legislation directed at safety is discussed in this report, even congressional actions that are not directed at highway safety per se can have important safety implications. One example is the enactment and subsequent repeal of the national 55-mph speed limit. That law was enacted for energy conservation but had major safety benefits. Furthermore, Congress is a frequently changing body and is organized into dozens of committees and subcommittees having jurisdiction over different aspects of road safety. Indeed, many of the federal agencies and programs discussed below are overseen and funded by different congressional

committees and authorized by legislation enacted by different Congresses. Developing a consistent and coherent national road safety policy and strategy is difficult under these circumstances.

The main federal transportation agencies with responsibilities for administering road safety programs are NHTSA, FHWA, and the Federal Motor Carrier Safety Administration (FMCSA). All three are all housed in USDOT. The U.S. Centers for Disease Control and Prevention (CDC), part of the U.S. Department of Health and Human Services, works with these and other federal agencies, especially NHTSA, in identifying, evaluating, and promoting actions to prevent injuries incurred in motor vehicle crashes.

NHTSA

Created by Congress in 1966 (as the National Highway Safety Bureau), NHTSA's mission is to reduce deaths, injuries, and economic losses resulting from motor vehicle crashes. Its main area of focus is promoting safe vehicles and driving, as well as occupant and pedestrian protection. To fulfill this mission, NHTSA sets and enforces standards for new motor vehicles and equipment; provides highway safety grants to state and local governments for data collection, safety education, emergency medical services, and traffic enforcement activities; and promotes the use of safety devices such as safety belts and child safety seats. NHTSA has a supporting program of research that includes collecting and analyzing crash data, assessing the safety impacts of new technologies, assessing injury causation and mitigation measures, examining crash avoidance and severity reduction measures, and studying driver behavior.

FHWA

FHWA's main mission is to provide financial and technical support to state and local governments for constructing, improving, and preserving the nation's highway system—a system almost entirely owned and operated by state and local governments. The emphasis of the federal-aid highway program, which the agency administers, is on the National Highway System, a 160,000-mile network that carries 40 percent of the nation's traffic. The federal-aid highway program also provides resources for 1 million additional miles of urban and rural roads. FHWA has an Office of Safety,

which focuses on highway planning, design, operations, and construction issues related to safety. The Office of Safety provides state and local highway agencies with safety training tools, statistics, and technology information. In addition, highway safety research is conducted at FHWA's Turner-Fairbank Highway Research Center in McLean, Virginia.

FMCSA

FMCSA was established as a separate agency within USDOT in 2000, after having been a bureau of FHWA. FMCSA's main responsibility is to promulgate and administer federal regulations governing commercial truck and bus operations, including truck size and weight limits and driver qualifications and hours of service. The agency collects and analyzes truck safety data, including inspection, violation, and crash data submitted by states. It also has an education and technical assistance program that offers motor carriers advice on developing safety management programs, employing preventive maintenance, and training truck operators in defensive driving.

CDC

CDC is one of the 13 major operating components of the Department of Health and Human Services. One of the CDC's main centers, established in 1992, is the National Center for Injury Prevention and Control (NCIPC). As the lead federal agency for injury prevention, NCIPC works closely with other federal agencies, state and local entities, and research institutions. NCIPC's Motor Vehicle Injury Prevention Team works closely with NHTSA on developing and evaluating behavioral and engineering solutions to prevent motor vehicle crash injuries and deaths. Center scientists, for example, have conducted reviews of government programs and community-based efforts to increase the use of safety belts and to decrease alcohol-impaired driving.

State Government

The 50 states, the District of Columbia, and Puerto Rico each has its own governmental structure for administering highway systems, driver licensing, injury prevention programs, traffic law enforcement, and other road safety activities. Some house all or most of these activities in two or three government agencies, while others have them spread among many more

agencies and offices, including cabinet-level transportation, public health, public safety, and state police departments.

State Departments of Transportation and Highway Agencies

Most states have established a cabinet-level department of transportation that administers state programs in all modes of transportation, including highways. In most instances, the highway divisions are the largest single units in the department. Typically, the state highway agencies are responsible for the design, construction, maintenance, and operations of all Interstate highways and most primary highways, with the exception of highways operated by toll authorities. In a few states, such as Virginia, West Virginia, and North Carolina, the state highway agency also administers, maintains, and operates secondary roads and local streets. While a few state highway agencies have a separate highway safety office, most house safety functions in the traffic engineering office.

Departments of Motor Vehicles

In many states, the department of motor vehicles (DMV) is housed within the department of transportation or within the department of public safety, which may also house the state police (or highway patrol). A few states, such as Virginia, have a cabinet-level DMV. These agencies administer state programs for driver licensing, motor carrier safety, and automobile inspection and registration. Accordingly, they are responsible for keeping records of and identifying at-risk drivers, monitoring graduated licensing programs, establishing driver licensing standards, setting requirements for driver education, and collecting crash data. Most of these responsibilities are safety related. At the same time, many DMVs have functions not related to safety, such as tax collection, vehicle emissions inspection, and voter registration.

State Police and Departments of Public Safety

State police (sometimes called highway patrols) operate in every state except Hawaii. One of their main responsibilities is to patrol highways and enforce motor vehicle laws and regulations, including laws governing commercial truck and bus safety. At the scene of crashes, state police also direct traffic, give first aid, and call for emergency equipment. State police

agencies are often housed within cabinet-level departments of public safety, and some are even responsible for administering their state's DMV.

State police work with state highway safety representatives to identify high-priority enforcement areas and to develop and implement programs to deter drunk driving and encourage safety belt use. They also investigate motor vehicle crashes and are an important source of state and federal crash data.

Departments of Health and Education

State health departments have a number of roles relating to road safety. They administer state injury prevention programs that maintain trauma and injury databases and coordinate with other public agencies and community groups to promote child passenger safety, pedestrian and bicycle safety, and young-driver safety. Such programs are often funded with federal grants administered by the governor's highway safety office. Health departments are also usually responsible for statewide planning of trauma centers and for providing training, certification, and technical assistance for emergency medical service providers, especially in rural areas. In some states, such as Texas, Montana, and Wisconsin, state education departments develop alcohol and traffic safety education materials, model driver training curricula, and standards for school driver education instructors. These responsibilities may also be carried out by other state agencies such as public safety agencies, DMVs, and departments of transportation.

Governor's Highway Safety Representative

The Highway Safety Act of 1966 established the State and Community Highway Safety Grant Program, commonly known as the 402 program. The 402 program calls for the governor of each state to appoint a highway safety representative to administer the 402 grants. About half of governor's highway safety representatives (GRs) reside in state departments of transportation and DMVs, while most of the rest reside in public safety and state police agencies. In a few states, the GR heads a separate office in the executive branch.

The GR and 402 funds focus mainly on the behavioral aspects of highway safety rather than on highway engineering. For example, they may

develop safety programs to improve the skills of young and elderly drivers, encourage safety belt and helmet use, and discourage drunk driving. Appointed by the governor, the GR has an important leadership role in promoting safety initiatives in the state legislature, coordinating safety activities among state and local agencies, and working with local communities to implement traffic safety programs. Appointees with safety expertise and strong communications and management skills are therefore desirable, along with a highly competent staff of road safety professionals to develop and implement the programs. Because federal 402 funds are sometimes suballocated to counties and other local jurisdictions by formula prescribed in state legislation, the role of the GR can be greatly diminished in practice.

Local Government

More than 75 percent of public road mileage in the United States is owned and operated by local jurisdictions (FHWA 2005a). In most states, counties, cities, and towns own, operate, and maintain most local streets and many collectors and minor arterials. There are more than 3,000 counties and many more municipalities, towns, townships, villages, and other general-purpose local governments in the United States. Counties alone operate twice as much road mileage as states.

Local entities differ in how they administer their road systems. In New England and a few other states (e.g., Pennsylvania, Delaware), all local (nonstate) roads are administered by municipalities, towns, or townships rather than counties. Large municipalities often administer their systems through a public road agency or department of public works; however, many smaller jurisdictions operate their limited road networks through the general unit of government. Counties typically have road commissions or departments of transportation and public works.

Most county and municipal governments also establish traffic laws in their jurisdictions and apply sanctions for noncompliance. Many local police work with the state police in implementing DUI, heavy truck, safety belt, and work zone safety education and enforcement programs. Local police also have an important role in investigating crashes and submitting crash data to state and federal agencies.

Most emergency medical services are also provided by local governments, and city and county health departments are often a focal point for state safety programs, such as child safety seat distributions. In some localities, public school systems play an important role in instructing student drivers and teaching pedestrian safety to pupils of all ages. In these localities, high school driver education programs teach students the rules of the road, basic vehicle control skills, and safe driving skills. In general, high school driver education classes are taught by teachers employed by the school system or through contracts with private driver education services. Schools and school-related organizations also educate young students on pedestrian and bicycle safety and teenagers on the risk of driving under the influence of alcohol and drugs.

Regional Planning Agencies

Although regional (e.g., metropolitanwide) governance is rare in the United States, regional transportation planning agencies are common. There are nearly 400 metropolitan planning organizations (MPOs) in the country covering all urbanized areas. Federal law requires that all transportation projects in urbanized areas of 50,000 people or more be prioritized within the framework of a comprehensive urban transportation plan developed cooperatively by the state and local governments. MPOs are thus responsible for approving significant expenditures of transportation funds. As discussed later in this report, MPOs are increasingly expected to give direct consideration to safety as one of their planning goals and to include safety performance in their data collection programs and measures of system performance.

KEY POLICIES AFFECTING THE PUBLIC-SECTOR SAFETY ROLE

Before the 1960s, the government's role in ensuring highway safety rested largely with the individual states and local governments, which established and enforced traffic laws and oversaw driver education courses, vehicle inspection, and driver testing and licensing programs. For the most part, the federal government limited its involvement to

conducting research and providing technical advice for the design and construction of safe highways. Landmark legislation enacted by Congress in 1966 redefined and elevated the federal role.

The two major pieces of legislation enacted were the National Traffic and Motor Vehicle Safety Act and the Highway Safety Act of 1966. The former act gave NHTSA responsibility for establishing and enforcing regulations aimed at making motor vehicles safer to operate and more crashworthy. The Highway Safety Act focused on the human (driver, pedestrian) and highway-related aspects of the road safety problem. Both acts have had major safety implications. The Highway Safety Act is discussed in greater detail below because it has had more impact on the safety responsibilities and resources of state and local governments.

Highway Safety Act

The Highway Safety Act created a federal highway safety grant program and required governors of states to be responsible for the administration of the program. As mentioned earlier, Section 402 established national standards to guide state and local highway safety programs and authorized federal grants to support their implementation. NHTSA and FHWA were given responsibility for jointly administering the grants and other provisions of the act, but state and local governments remained the focal point of implementation.

The 402 grant program remains in effect today, although it has been modified over the years. The funds can be used by states for a variety of safety initiatives including data analyses, safety education programs, and communitywide pedestrian safety campaigns. The program was most recently modified in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users of 2005 (SAFETEA-LU). The act doubled the amount of 402 funds apportioned for safety. It also expanded the types of projects eligible for safety funding, including safety conscious planning, public safety awareness campaigns, traffic education and enforcement, and collection and analysis of crash data.

SAFETEA-LU emphasizes the adoption by states of a data-supported and strategic approach to highway safety improvements. States are required to develop and implement a strategic highway safety plan and establish a program of projects or strategies to implement the plan. Projects must

be selected on the basis of sound data analyses that allow locations with the greatest safety need to be targeted. States are required to submit an annual report to USDOT assessing the effectiveness of the funded improvements in reducing crashes. The report must describe at least 5 percent of locations exhibiting the most severe safety needs and assess potential remedies, their costs, and other impediments to addressing the needs.

In developing and implementing the strategic safety plan, states are expected to work closely with local governments and MPOs and to ensure that all public agencies with safety roles are involved in sharing data and resources and in establishing common goals and priorities. The plan must explain how such cooperation will be brought about, and the annual evaluations must demonstrate the safety impacts of these collaborative efforts.

State Initiatives

AASHTO published its first national Strategic Highway Safety Plan in 1998 (AASHTO 2005). It was developed by state representatives on the AASHTO Standing Committee on Highway Traffic Safety with help from national safety experts in driver, vehicle, and highway issues. After the plan was released, a number of states developed their own strategic safety plans modeled on the AASHTO plan, including Maryland, Florida, Iowa, and Pennsylvania.

AASHTO's strategic safety plan, updated in 2005, focuses on 22 specific highway safety challenges or "emphasis areas." Safety strategies are outlined for each emphasis area. For example, the plan calls for a comprehensive and integrated approach to reducing the incidence and severity of crashes in which vehicles run off the roadway, including better pavement markings for driver guidance, enhanced compatibility of vehicle designs and roadside features such as side slopes and culverts, and driver education and training programs that teach proper use of antilock brakes.

AASHTO charged the National Cooperative Highway Research Program (NCHRP) with developing a series of guidebooks to assist state and local agencies in responding to each of the emphasis areas identified in the strategic safety plan. The resultant *NCHRP Report Series 500* consists

of 22 volumes that correspond to each emphasis area (TRB 2003–2006). Most of the volumes have been completed and are being distributed to state and local governments. Each guide includes strategies and countermeasures to address specific safety problems and model processes for implementation. The strategies range from those having well-documented safety benefits to those remaining experimental but exhibiting promise. In addition, the companion *NCHRP Report 501: Integrated Safety Management Process* provides a framework for coordinating a safety program (Bahar et al. 2003). It presents various ideas for integrating and coordinating engineering, enforcement, emergency response, and education efforts within a jurisdiction and determining the most effective combination of strategies to deploy.

AASHTO has also tasked NCHRP with developing a *Highway Safety Manual* that will quantify and predict the safety effects of changes in specific elements of roadway design, maintenance, construction, and operation. The goal is to produce a manual that is widely accepted within the field of transportation engineering and that presents state-of-the-art, quantitative information on safety measures. It is expected to be science based and regularly updated to reflect the results of research. The first edition of the manual is scheduled for release in 2008. Other commonly used manuals in the field of highway engineering, such as TRB's *Access Management Manual*, have been updated to reflect a growing body of research on related safety impacts and benefits.

Local Initiatives

Most fatal crashes occur on locally owned and maintained roads. Local governments, acting through national associations such as the National Association of County Engineers, the American Public Works Association, and the U.S. Conference of Mayors, have therefore periodically focused attention on the traffic safety problems of local highways and streets. In 1993, the Institute of Transportation Engineers, whose membership includes many municipal and county transportation engineers, published the first edition of the *Traffic Safety Toolbox: A Primer on Traffic Safety* (ITE 1993). The *Toolbox*, which was last updated in 1999 (ITE 1999), was developed for use primarily by transportation officials from local jurisdictions.

In the Overview chapter of the *Toolbox*, Professor Ezra Hauer remarks that the challenge is to ensure that each edition “be based on more sound, empirical, and defensible knowledge.” Indeed, local governments, like states, are increasingly expected to take a more rigorous and scientific approach to managing safety on their road systems. Congress has required states to ensure that 40 percent of Section 402 funds be used to meet local traffic safety needs and that local safety initiatives be integrated into each state’s strategic highway safety plan and program.

SUMMARY

The road safety problem is large and complex, but much progress has been made over the past 40 years in controlling it. Continued progress will require scientific rigor in monitoring and understanding safety needs and in devising, implementing, and evaluating solutions that work together to improve safety on a systems level. There is little question that the public sector must have a prominent role in managing road safety; the more relevant question is how best to use and coordinate the capabilities and resources of federal, state, and local governments for this purpose. The diversity of institutions with road safety responsibility, encompassing federal, state, and local governments and many disciplines, creates significant challenges with respect to communications, terminology, perspective, and capabilities. As the remainder of this report indicates, meeting these challenges is critical in building a road safety workforce.

The efforts of federal, state, and local governments to improve road safety have become better coordinated over the years, but a significant challenge lies ahead in building a more comprehensive, systems approach to safety management. The enactment of federal legislation such as the Highway Safety Act of 1966 has prompted more coordinated and rational public-sector efforts to address the safety problem. New initiatives such as evidence-based safety planning in some states are intended to further this harmonization of public safety programs. The institutions with safety responsibility and influence, however, remain widely dispersed both within and across jurisdictional levels.

Fostering a systems-level approach to safety management presents many political and institutional challenges that are beyond the scope of

this study. However, building a highway safety profession that transcends jurisdictional and institutional boundaries and shares a common body of knowledge and skills is a critical step in meeting these challenges. The focus of the remainder of this report is on achieving this outcome.

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Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
CDC	Centers for Disease Control and Prevention
FHWA	Federal Highway Administration
ITE	Institute of Transportation Engineers
NHTSA	National Highway Traffic Safety Administration
TRB	Transportation Research Board

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The Road Safety Workforce in the Public Sector

This chapter describes workers in the road safety workforce in the public sector and approximates their number. The first half of the chapter describes the evolution of this workforce over the past several decades, during which period a multidisciplinary road safety profession gradually emerged. In the second half, estimates are made of the size of the workforce, particularly those who spend all or most of their work time on road safety. The estimates suggest a surprisingly modest number of road safety workers, even under a fairly liberal definition of the positions that warrant inclusion.

EMERGENCE OF A ROAD SAFETY PROFESSION

The concept of a road safety profession has taken many decades to bring about. For much of the 20th century, the rising number of deaths and injuries from motor vehicle crashes was viewed as alarming but treated largely as an intractable side effect of mobility. Before World War II, most crashes were viewed as a consequence of bad driving or bad luck, and little attention was given to occupant protection in the event of a crash. Crash records were not detailed and were sporadically collected. To a large extent, those who investigated crash causation and prevention did so on a part-time basis, and usually from the vantage points of traffic engineering and law enforcement.¹

Following a sharp increase in traffic fatalities after World War II, President Truman convened a series of national road safety conferences. The conferences brought national attention to the need for better crash

¹ See De Silva (1942) for a detailed account of the treatment of highway safety before World War II.

records and analyses, more uniform traffic laws, driver education in high schools, and stricter standards for licensing. By the 1950s, a more scientific and holistic approach to improving road safety was emerging, as motor vehicle crashes and their consequences were recognized as having multiple causal and contributing factors. Experts in statistics, epidemiology, mechanical engineering, and biomechanics were examining the causes and mechanisms of crash injury. By gathering and analyzing crash data, investigating actual crashes, and crash-testing vehicles, they began to understand how motorists sustained injuries and the protective effects of safety belts and other devices such as cushioned dashboards and collapsible steering wheels. Coincidentally, the public investment in Interstate highways prompted more research on such topics as sign legibility, lighting, ramp geometry, guardrail placement, and lane marking. This research gave highway engineers a better understanding of how to design safer highways.

The growing body of safety knowledge did not prompt immediate changes in public programs, laws, or standards governing the safety of highways, vehicles, and operations. In 1960, responsibility for road safety programs at the federal level, for example, remained spread among several agencies, including the Bureau of Public Roads, the Interstate Commerce Commission, and the Division of Accident Prevention of the Public Health Service. At the time, few state highway offices or officials had “safety” in their titles. However, a small, multidisciplinary safety workforce was emerging, populated not only by traffic engineers and traffic police but also by experts drawn from the fields of psychology, statistics, economics, planning, public policy, and education.

As discussed in the previous chapter, the Highway Safety Act of 1966 and other federal legislation created new government agencies and programs with safety missions that began to spur the demand for safety experts and workers at the federal, state, and local levels. As a condition for federal grants, the governor of each state was required to appoint a road safety representative responsible for developing and ensuring the implementation of statewide road safety programs. States would therefore need to employ more experts in safety engineering, program planning and evaluation, and data collection and analysis. Much of the workforce demand, however, would emerge from local governments, which were required to

implement the new safety programs. For example, Virginia passed legislation requiring the creation of road safety commissions in each of its 134 counties and cities. New York required local jurisdictions with populations exceeding 50,000 to establish traffic safety boards responsible for coordinating all local road safety activities. These localities and thousands of others across the country began hiring safety personnel in categories such as traffic records analysts, accident investigators, police traffic safety officers, and teachers for driver education programs.

While the Highway Safety Act created demand for road safety workers, it did not address the need to educate and train workers in the safety field. Consequently, a number of studies were undertaken during the late 1960s and early 1970s on safety workforce needs and attendant training and instructional requirements. The studies were sponsored by the U.S. Department of Transportation (USDOT) (Booz, Allen, and Hamilton 1968), the American Association of Junior Colleges (Bishop and Sheehe 1968), the International Association of Chiefs of Police (Smith 1969), the National Association of Counties (National Association of Counties Research Foundation 1970), the Highway Users Federation for Safety and Mobility (Bishop et al. 1971), and the National Safety Council (Traffic Education and Training Conference 1972).

While interest in the road safety workforce peaked during the early 1970s, other demands were being placed on government agencies that would increase the need for experts in other fields such as environmental protection. New federal legislation such as the Clean Air Act Amendments, the National Environmental Policy Act, and the Archeological and Historic Preservation Act compelled state transportation agencies, metropolitan planning organizations (MPOs), and local highway agencies to hire more experts in environmental planning and engineering, archeology, biology, and cultural resource management. Likewise, growing public concern over illegal drug use and criminal activity caused state and local police agencies to hire, train, and deploy more officers for drug enforcement.

During the 1980s, a number of developments in road safety occurred that have had enduring effects on the road safety profession and the orientation of road safety programs. Mothers Against Drunk Driving was established in 1980 and quickly became a highly effective advocate for policies to reduce impaired driving. Although it had been a long-standing

safety problem, impaired driving became the subject of a multifaceted attack that included increases in the minimum drinking age, more stringent blood alcohol standards, prearrest breath-testing, swifter and more severe licensing sanctions, driver education, and public information and enforcement campaigns. Many state and local police departments established special units focused on apprehending and gathering evidence on impaired drivers. And many new specialists began entering the road safety field to support these efforts, including toxicologists trained in testing for alcohol and other drugs, prosecuting attorneys dedicated to DUI adjudication, and psychologists and sociologists knowledgeable in prevention and deterrence strategies.

The treatment of impaired driving is representative of how U.S. public policy started to become more balanced and comprehensive in addressing road safety. Safety policies and programs increasingly addressed the problem from the multiple angles of the driver, the road, and the vehicle and in its precrash, crash, and postcrash dimensions. Public policies also used a wider array of educational, engineering, enforcement, and economic strategies. There are several examples. To reduce crashes involving teenagers, high school driver education programs were coupled with graduated licensing requirements, parent awareness programs, and stricter enforcement of the minimum drinking age. Improvements in truck safety were sought through a combination of inspections, driver licensing standards, and limits on daily hours of driving, as well as truck-related highway designs such as shoulder rumble strips and larger guardrails and barriers. To encourage the use of occupant restraints, state governments passed mandatory seat belt laws, funded campaigns to publicize their safety benefits, and urged the development of more ergonomic designs for seat belts and child safety seats.

In recent years, several state departments of transportation have begun to incorporate road safety audits into their efforts to enhance safety. Such audits are formal safety performance examinations of existing or planned roads or intersections performed by an independent team. According to the Institute of Transportation Engineers, at least 10 states have instituted audit programs.² They are viewed as a proactive safety tool for new

² <http://www.roadwaysafetyaudits.org>.

projects and as a way for states to prioritize safety improvements on their systems.

Instituting a systems approach to road safety management remains challenging for a number of reasons, including the institutional factors discussed in the previous chapter. Nevertheless, the success of such efforts to date suggests that this approach is essential in achieving continued safety gains in the face of growing motor vehicle travel. Such an approach will have significant implications for the road safety workforce.

SCALE AND SCOPE OF THE ROAD SAFETY WORKFORCE

Estimation of the scale and scope of the current road safety workforce and prediction of its future dimensions are difficult because of the thousands of public agencies with road safety responsibilities and the diversity of expertise required for safety management. This is true of the number of full-time road safety professionals and even more so of the many other workers who influence road safety.

Distinguishing Between Road Safety Professionals and Contributors

Road safety professionals are defined in this report as workers who spend all or most of their workday on matters pertaining directly to road safety, such as assessing safety performance and needs; planning, developing, and implementing safety initiatives; and taking specific actions related to safety. Examples of full-time safety professionals are road safety engineers, directors and staff of governors' highway safety offices, safety regulators, safety data analysts, safety program developers and evaluators, and patrol officers dedicated to traffic safety. Certain other occupations that have a direct bearing on safety, such as traffic engineers, also merit inclusion as full-time road safety professionals, even though some of these workers may not view themselves as safety workers.

In most public agencies only a handful of employees are described as safety professionals either in their job titles or in organizational charts. Accordingly, many workers who contribute to road safety on a regular

basis do not view themselves as part of the road safety workforce. One prominent example of an important safety contributor is the chief engineer of a highway agency, since that person prioritizes projects and makes budgetary decisions on a regular basis that can have major safety implications. Further down the organizational chart, a maintenance engineer has many day-to-day responsibilities critical to ensuring safe roads, including the removal of snow and ice from pavement surfaces and the maintenance of drainage, guardrails, and lighting systems. Many other highway agency personnel, such as construction engineers and bridge designers, have responsibilities that are clearly important to ensuring road safety. Other public agencies have similar situations; command personnel in police agencies and planners in regional and metropolitan planning organizations are examples.

In the following estimates of the road safety workforce at the federal, state, and local levels, an attempt is made to distinguish between safety professionals and contributors, although at times the distinction is difficult to maintain. Estimates are developed for safety professionals in all cases, and in many cases for contributors as well.

Federal Agencies

Three USDOT agencies with prominent roles in road safety are the National Highway Traffic Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA), and the Federal Highway Administration (FHWA). Safety is the primary mission of the first two agencies. In the case of FHWA, ensuring safety is a critical agency goal along with other goals such as enhancing mobility and preserving the highway infrastructure. Elsewhere in the federal government, the Centers for Disease Control and Prevention (CDC) administers the National Center for Injury Prevention and Control (NCIPC), which has a staff devoted to road safety analyses and initiatives.

NHTSA

NHTSA employs nearly 600 people, most of whom are located in the agency's Washington, D.C., headquarters. The workforce is split among the various program offices of NHTSA's statistical analysis, rulemaking, enforcement, vehicle safety research, and research and program devel-

opment divisions. All of NHTSA's divisions and programs, with the possible exception of the Corporate Average Fuel Economy program, are focused exclusively on safety. The agency's workforce is multidisciplinary because its programs cover vehicle safety compliance, regulatory analysis, consumer information, impaired driving, occupant protection, emergency medical services, and behavioral and human factors research. The workforce consists of engineers, statisticians, economists, lawyers, psychologists, and program evaluators, among others. On the basis that about one-third of NHTSA's workforce provides administrative, information technology, financial management, and other common support services that do not necessarily require safety expertise or training, a rough approximation is that NHTSA employs about 400 full-time road safety professionals.

FHWA

FHWA has about 2,800 workers (Table 3-1). A large portion of this workforce—about 45 percent—consists of engineers. The agency also employs many planners, environmental specialists, economists, and lawyers. FHWA personnel with the most direct responsibility for road safety work in the Office of Safety, which provides state and local highway agencies with safety training tools, statistics, and technology information.

TABLE 3-1 FHWA and FMCSA Workforces by Occupation

	FHWA	FMCSA
Information technology	49	16
Human capital	48	11
Finance	106	7
Legal	50	34
Program management	134	57
Physical scientist	19	1
Planning	117	0
Engineering	1,257	4
Transportation specialist	226	105
Transportation industry specialist	0	0
Safety inspector	6	650
Other administrative and support	784	185
Total workforce	2,796	1,070

SOURCE: USDOT 2006.

The Office of Safety has about three dozen professional staff. In addition, FHWA conducts safety research at its research center in McLean, Virginia. About 20 researchers, engineers, analysts, and technologists work in the Office of Safety R&D.

The role of the Office of Operations in administering programs in traffic control, intelligent transportation systems, emergency operations, and hazardous materials transportation gives it an important influence on safety. It has a staff of about 50. The Office of Operations R&D employs 12 researchers. USDOT's Intelligent Transportation System Joint Program Office, which is closely connected to FHWA's Office of Operations, has a workforce of 15 professionals. Within the Office of Planning, FHWA has a six-member safety planning team. All of these program staff, totaling about 150, are full-time safety professionals. In addition, each of FHWA's 52 operating divisions (located in each state, the District of Columbia, and Puerto Rico) employs three to six safety and operations engineers, totaling about 250 nationally.

A reasonable approximation is that FHWA employs about 400 full-time safety professionals. In addition, the agency's professional staff in many other offices, including infrastructure (bridge and pavement technologies), policy studies, planning, and professional development (National Highway Institute), have responsibilities that contribute to road safety. About 800 engineers are employed in these other offices; the committee assumes that all 800 are safety contributors.

FMCSA

FMCSA employs nearly 1,100 workers in its offices for research and analysis, bus and truck standards, enforcement and compliance, and special safety programs. About 650 are safety inspectors, including about 275 border enforcement personnel (see Table 3-1). Other FMCSA staff administer grants for state motor carrier enforcement and safety programs, provide technical assistance to industry and state and local agencies, assist in the development of safety standards and campaigns (e.g., hours-of-service rules, "Share the Road Safely" initiatives), and administer R&D programs related to safety such as intelligent vehicle crash avoidance technologies. The number of program managers, engineers, and transportation specialists at FMCSA totals about 175. These 175 workers

are full-time safety professionals. The 650 FMCSA inspection personnel at the field level are assumed to be key safety contributors.

CDC

The Motor Vehicle Injury Prevention Team of CDC's NCIPC works closely with NHTSA in developing and evaluating behavioral and engineering solutions to prevent motor vehicle crash injuries and deaths. The team consists of approximately 12 professional staff with expertise in multiple disciplines including epidemiology, preventive medicine, and public administration.

Federal Totals

The preceding estimates suggest that four federal agencies with road safety responsibilities collectively employ about 1,000 full-time road safety professionals and another 1,450 workers who contribute to road safety (see the table below).

	Full-Time Road Safety Professionals	Others in Workforce Contributing to Road Safety
NHTSA	400	—
FHWA	400	800
FMCSA	175	650
CDC (NCIPC)	12	—
Total	~1,000	1,450

State Government

The main agencies within state governments that employ road safety professionals are state departments of transportation, the offices of governor's highway safety representatives (GRs), departments of motor vehicles (DMVs), state police, and the injury prevention and control programs of departments of public health and safety.

State Departments of Transportation

The departments of transportation in the 50 states, the District of Columbia, and Puerto Rico employ a total of about 270,000 workers, including about 30,000 personnel in management and other professional positions. As might be expected, a major professional occupation

is civil engineering. Every few years, the American Association of State Highway and Transportation Officials sponsors a survey of its member departments of transportation to determine the number and average salaries of common occupations. The most recent survey was conducted in 2004 by the Iowa Department of Transportation (AASHTO 2004). Analyses of the survey data indicate the total and average number of positions for management and professional occupations given in Table 3-2.

How many of the tens of thousands of workers employed by state departments of transportation can be characterized as full-time safety professionals or as key contributors to road safety? As a starting point, the positions shown in italics in Table 3-2 are assumed by the committee to have important safety influence. They include professionals in executive and management positions as well as workers in implementation positions. The secretary, major division chiefs, legal director, and chief finance officer have important roles in managing and guiding resources available to safety programs and initiatives. While some of the engineering and planning staffs are full-time safety professionals, all are likely to have responsibilities with safety implications. The total number of workers in these occupations for the 52 state departments of transportation is about 5,500, an average of about 100 per state.

Although all 5,500 of these workers influence road safety to some degree, only a fraction are full-time safety professionals who spend most of their work time on safety. To approximate this subset, more specific information provided to the committee by several individual states is used to extrapolate to the nation. Information provided to the committee by the Washington State Department of Transportation suggests that 50 workers have full-time safety responsibility from a total of 181 workers who contribute to safety, or about 28 percent. Similar information from the Michigan Department of Transportation suggests that 17 professionals work full-time on safety from a workforce of 117 safety contributors, or about 15 percent. Information from the Iowa and North Carolina Departments of Transportation indicates that 32 percent and 11 percent of safety contributors, respectively, are full-time safety professionals. While there is much variability from state to state, the numbers suggest

TABLE 3-2 State Department of Transportation Management and Professional Workforce Positions

	Number of Positions	Average per State
Administration, total	379	7
Secretary/chief administrative officer	52	1
Major division chief	275	5
Public information director	52	1
Legal, total	387	7
Legal director/general counsel	52	1
Right-of-way director	75	1
Staff attorney	260	5
Information technology, total	1,152	23
Information technology director	52	1
Programmer/analyst	1,100	22
Human resources, total	302	6
Human resources director	52	1
Training manager	70	1
Training specialist	180	4
Planning and environment, total	1,900	38
Manager	100	2
Environmental analyst	650	13
Archeologist/cultural analyst	250	5
Planners	900	18
Finance, total	377	7
Chief finance officer	52	1
Auditors/finance manager	325	6
Scientist specialist, total	375	7
Chemist	100	2
Biologist	150	3
Geologist	125	2
Engineering, total	4,019	79
Chief highway engineer	52	1
Safety director	52	1
Major division engineer	350	7
Bridge design engineer	100	2
District engineer	440	9
Maintenance lead engineer	525	10
Project engineer	2,500	49
Other occupations, ^a total	>30,000	~600

^a Examples are clerks, laboratory technicians, equipment operators, mechanics, maintenance workers, surveyors, toll collectors, appraisers, and information technology technicians.

SOURCE: AASHTO 2004.

that about 20 percent of the total state department of transportation safety workforce of 5,500 can be defined as full-time safety professionals, or about 1,100. The remaining 4,400 workers are best characterized as safety contributors.

As noted earlier, many state departments of transportation do not have safety offices or divisions; safety personnel are spread among many units, including traffic engineering and operations. Hence, the accuracy of the above estimates is difficult to gauge, especially in comparison with other professions within state departments of transportation. For example, nearly all state departments of transportation have environmental divisions, most created during the past 30 years in response to federal and state legislation requiring environmental analyses and mitigations of highway construction projects, maintenance, and operations. The committee asked (via e-mail) the safety engineers from several state departments of transportation to estimate the number of environmental experts on the staff of their organizations. In most cases, the numbers were derived quickly by counting the number of full-time professionals in environmental services units; for example, Montana reported 41, Ohio 54, Oregon 79, Missouri 26, Louisiana 19, and Maine 30. Interestingly, the same departments reported having far fewer full-time safety professionals—the total for the six states was 48, compared with 249 full-time environmental professionals. This differential may be the result of some safety professionals not being fully accounted for because they are spread among several offices and division within each department. However, it may also reflect the fact that analyses and mitigations of environmental impacts of highways are explicit requirements of federal and state legislation, and they must be administered by environmental experts.

Office of the GR

By definition, the GR professional staff members are full-time safety professionals. A review of the online organizational charts and staff directories of GRs' offices in several states suggests that they are modestly staffed. Positions range from data and research analysts to program managers, trainers, grants officers, and communications specialists. A professional staff of five to 20 is the norm; for example, Iowa has five positions, North Carolina 10, Louisiana 15, Oregon 18, Nevada 11, Idaho 12, and Kansas

nine. California, the most populous state, has a comparatively large staff of 33. Assuming an average staff of 15 in each of the 52 GR offices suggests that there are about 800 GR full-time safety professionals nationally, which is the figure used here.

DMVs

Responsibilities of state motor vehicle administrations include driver licensing and driver improvement, vehicle titling and registration, vehicle inspection, and motor carrier regulation. Safety-related responsibilities require personnel capable of analyzing driver violation and crash data as well as mental and physical conditions that can affect safety performance. DMVs employ vehicle standards engineers, field inspectors, and hazardous materials specialists. They also employ workers who implement the provisions of state laws relating to driver qualification, driver training, and vehicle safety.

The organization of motor vehicle administration services varies from state to state, with some administered by state police, others residing in state departments of transportation, and others established as independent agencies. Consequently, estimating the number of safety professionals in DMVs is complicated by the variety of organizational structures. On the basis of the available information, the committee estimates that state DMVs average about one dozen full-time safety professionals, which assumes two or three professional-level staff fulfilling each of the various safety-related functions listed above. This estimate results in a national total of 600 full-time road safety professionals in state DMVs.

State Police and Highway Patrols

Data from the U.S. Department of Justice indicate that there are about 56,000 full-time state police nationally (Table 3-3). Uniformed patrol officers, or troopers, make up at least two-thirds of the force in most states. Because they maintain regular patrols and respond to calls for service, these officers are critically important in the implementation of traffic safety measures.

In the committee's view, the state police who are more likely to be full-time road safety professionals include the command and line personnel who plan, program, oversee, and carry out traffic law enforcement

TABLE 3-3 Local and State Police Agencies and Full-Time Officers

Type of Agency	Number of Agencies	Number of Full-Time Sworn Officers
Total		796,518
Local police/sheriff	15,736	605,631
State police	49	56,348
Special jurisdiction and Texas constable	1,999	46,043
Federal (nonmilitary)		88,496

NOTE: Special jurisdiction category includes both state-level and local-level agencies.
SOURCE: U.S. Department of Justice 2004.

activities. These officers may include district commanders, patrol supervisors, and patrol officers who administer and implement traffic safety programs. Examples include officers in units devoted to investigating traffic crashes, analyzing safety data, preparing traffic court cases, and coordinating safety programs with other public agencies such as traffic courts, highway departments, and emergency medical services. Many state police agencies have specialized traffic service units and task forces that investigate accidents or focus on particular safety concerns such as DUI and commercial vehicle safety. Most top command personnel such as the chief, deputy chief, assistant chiefs, and bureau chiefs are road safety contributors because their decisions affect the level of resources available for traffic safety programs and services.

One means of estimating the number of full-time and contributing road safety professionals in state police agencies nationally is to extrapolate from estimates developed for a few state police agencies. In this regard, the Washington State Patrol (WSP) is a helpful example and data point. Four WSP bureaus administer programs that are relevant to traffic safety. The Field Operations Bureau has primary responsibility for traffic law enforcement. It consists of eight district offices and a commercial vehicle services division. The Management Services Bureau oversees strategic planning and performance studies. The Technical Services Bureau provides data and statistical information on traffic crashes. The Forensic Laboratory Services Bureau provides statistics and analyses for DUI enforcement. In the committee's view, the heads of these four bureaus (four assistant chiefs), as well as commanders of the eight district offices

and commercial vehicle services division, are full-time safety professionals. They total 13 from a uniformed WSP workforce of 871.

The estimated number of road safety professionals in WSP is somewhat higher than figures for several other state police agencies derived from contacts with these agencies. The North Carolina State Highway Patrol has an estimated nine full-time road safety professionals on a force of 1,400 officers. The Michigan State Police and the Iowa State Patrol have five and three full-time road safety professionals on workforces of 2,100 and 450, respectively. These figures should, but do not, include the heads of units with traffic safety responsibilities. Accordingly, the committee believes that a reasonable approximation of the average number of full-time road safety professionals per state police agency is 15 officers, or about 800 nationally.

With regard to safety contributors in the state police workforce, WSP has eight command personnel—a chief, a deputy chief, and six other bureau chiefs—who should be counted. The agency also has 89 supervising sergeants and 87 commercial vehicle safety officers on a total force of 871 officers. Thus, about one in five (184/871) of the agency's officers can be characterized as road safety contributors. Applying this ratio to the national total of 56,000 state police officers suggests that there are more than 10,000 road safety contributors among state police agencies, or an average of about 200 per state.

Health Departments and Injury Prevention Programs

State injury prevention programs, which are usually administered by public health departments, may have several staff who work part-time on road safety or one or two full-time road safety professionals. These staff may be shared or working closely with the staff of governor's highway safety representatives. The committee assumes that this workforce is fairly small, consisting of about 100 full-time safety professionals nationwide.

State Totals

The rough estimates above suggest that there are about 3,400 full-time safety professionals and 14,000 safety contributors in the workforces of state agencies (see the following table).

State Agency	Full-Time Safety Professionals	Others in Workforce Contributing to Safety
Departments of transportation	1,100	4,400
GR offices	800	—
DMVs	600	Unknown
State police agencies	800	10,000
Health departments (injury prevention programs)	100	—
Total	3,400	14,400

Road Safety Professionals in Local and Regional Government

In practice, local governments have a major role in road safety. There are more than 3,000 counties in the United States and many more municipalities, towns, townships, villages, and other general-purpose local governments. Many of these entities maintain roads and operate police forces. Local governments regulate (e.g., set speed limits), operate, and maintain more than 75 percent of the nation's highway mileage. The U.S. Department of Justice estimates that there are more than 15,000 local police agencies that employ more than 600,000 officers (Table 3-3). County and municipal governments also administer most traffic courts and provide emergency medical services. They have other safety-related responsibilities such as school transportation and driver and pedestrian education programs. The planning, administration, and supervision of these programs require personnel trained in specific aspects of road safety. Some localities have appointed traffic safety coordinators responsible for working with local school boards, police, traffic courts, fire departments, public works departments, and other public and private entities to connect safety activities and provide liaison with state agencies such as the state department of transportation and the governor's highway safety office.

Local Highway Departments

Local highway agencies, typically road commissions or public works departments, vary widely in resources available to support safety personnel. At one end of the spectrum, many large municipalities and counties can afford to employ highway design, construction, and traffic engineers who are trained in detecting and developing solutions to

hazardous conditions. These agencies may assign field engineers and technicians to survey and ensure the safe condition of road surfaces, signing, lighting, and traffic control devices. At the other end, small local governments may not even have the resources to employ a general highway engineer, much less a professional engineer who is tasked to work full-time on safety.

As a point of reference, there are 15 full-time city and county traffic engineers and traffic safety specialists in Michigan and 10 in Iowa. Larger states with many more local jurisdictions and large cities, such as California and Texas, will have more local road safety personnel, and less populous states will have fewer. If Michigan's 15 local road safety professionals is assumed to be roughly indicative of circumstances in most states, then there are about 800 local safety professionals nationally.

Local Police

For most local police agencies traffic law enforcement is a primary responsibility. Larger police departments may have specialized traffic units with uniformed and civilian personnel trained in analyzing traffic records, recognizing and testing for impaired drivers, investigating crashes, planning surveillance programs, inspecting motor carriers, and administering public safety education programs (such as programs to promote pedestrian safety and the use of vehicle child restraints). Smaller police forces will have less specialization.

Estimating the number of local police officials who spend the majority of their time on traffic safety is complicated because of variability in agency size and organizational structure. For example, of the 285 local law enforcement agencies in the state of Washington, 90 percent employ 10 or fewer officers (nationally this figure is 95 percent). It is reasonable to assume that few, if any, of such agencies can afford to employ a police officer dedicated to road safety on a full-time basis. On the other hand, of the remaining 29 larger county and municipal police departments in the state, many are likely to have special traffic units that dedicate one or more officers to safety.

Nationally, about 50 local police agencies employ more than 1,000 officers, 150 employ 250 to 999, 400 employ 100 to 250, and 800 employ

50 to 99 (Hickman and Reaves 2003). The remaining local police agencies, numbering more than 14,000, have fewer than 50 officers. The largest 50 police agencies, which are comparable with state police agencies in size, are each assumed to have 15 full-time safety professionals (comparable with the number in state police agencies). The 150 large agencies with 250 to 999 officers are assumed to average one-third as many safety professionals (that is, to have five). The 400 medium-size agencies with 100 to 249 officers are assumed to average one-fifth as many (that is, to have three). Each small agency with 50 to 99 officers is assumed to have one full-time safety professional. None of the smallest agencies with fewer than 50 officers is assumed to have a full-time road safety professional on staff. The resulting estimate of 3,500 road safety professionals in local police agencies, based on these assumptions, is calculated in Table 3-4.

Metropolitan and Regional Planning Agencies

There are 392 MPOs in the United States, covering all urbanized areas. The workforces for MPOs serving the largest metropolitan areas can range in size from three or four dozen to more than 200. For example, the Metropolitan Transportation Commission, which has transportation planning (and some operational) responsibilities for the nine-county San Francisco Bay Area, has about 175 employees. The Puget Sound Regional Council, which serves the Seattle and Tacoma urban areas of Washington State, has a staff of 95. The Northeast Ohio Areawide Coordinating Agency, which serves the Cleveland area, has a staff of 50.

TABLE 3-4 Estimates of Full-Time Road Safety Professionals in Local Highway and Police Agencies

	Full-Time Road Safety Professionals
Local highway agencies, total	800
Local police agencies, total	3,500
Largest 50	750
Large	750
Medium	1,200
Small	800
Smallest	0
Grand total	4,300

Outside the nation's largest metropolitan areas, MPO staffs are much smaller, typically consisting of one to two dozen employees. For example, the Southeast Council of Governments, serving the region of Sioux Falls, South Dakota, has a staff of 11. The Chattanooga–Hamilton County Regional Planning Agency in Tennessee has a workforce of seven. The Michiana Area Council of Governments for the South Bend area of Indiana has a staff of 20.

Few, if any, MPOs serving small and medium-size metropolitan communities are likely to have a full-time road safety professional on staff. Furthermore, it is questionable whether even a majority of the largest 50 MPOs have full-time safety professionals on their planning staffs. For example, the Puget Sound Regional Council has one planner who works less than full-time on safety. An examination of the online organizational charts and staff rosters of several large MPOs did not reveal any positions with safety-related titles (such as safety planner).

Researchers working on NCHRP Project 8-44 on transportation safety planning have surveyed MPOs and asked them to rate safety-related planning relative to planning goals in seven other areas such as transit service, land use, air quality, elderly mobility, and capacity (Chang and Washington, unpublished paper). The researchers report that safety planning ranked fifth in importance. Of the 119 MPOs responding to the survey, 84 percent reported having no state or local laws requiring express consideration of safety effects during the development of transportation plans.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users made safety planning mandatory for state departments of transportation and MPOs, which should elevate safety among MPO planning priorities. However, at this early stage probably no more than 100 full-time safety professionals are employed among the nation's 392 MPOs.

Totals Across All Levels of Government

Even though most of the estimates above are inferred from limited data and on the basis of multiple assumptions, they provide a general sense of the scale of the road safety workforce in the public sector. They also reveal the wide scope of the workforce and how it transcends multiple organizations, disciplines, and occupations.

The size of the workforce, in terms of full-time road safety professionals, is modest—likely less than 10,000 workers nationally at all levels of government (see the table below).

Estimated Number of Road Safety Professionals

Federal	1,000
State	3,400
Local	4,300
Total	8,700

Inclusion of all workers who contribute to road safety could lead to an estimate of the workforce five to 10 times larger than that given above. The committee believes that this number could exceed 100,000 workers, given the many public agencies that have road safety responsibilities. In any event, the committee does not accept the idea that the road safety workforce consists only of a relatively small cadre of workers with “safety” in their titles and job descriptions. It is well within reason to include the managers and decision makers of these public agencies as well as the line and field personnel who perform specific tasks that affect safety. They are important contributors to safety and thus part of the road safety workforce.

SUMMARY

Fifty years ago, relatively few individuals in public safety, health, or transportation agencies had a job title or job description emphasizing road safety. Today, the mission statements of most or all such agencies give safety a prominent place. Indeed, a number of agencies and offices at the federal, state, and local levels are dedicated to road safety, such as NHTSA, FMCSA, and the governor’s highway safety representative in all states. These agencies employ hundreds of individuals with explicit road safety responsibilities.

However, a closer examination of the organizational charts of the many other public agencies with safety responsibilities indicates that the agency’s safety function is not always apparent in the descriptions and composition of the workforces. Personnel dedicated to safety full-time are often outnumbered by workers specializing in areas such as environmental planning, traffic operations, highway design, and criminal

investigations. In most cases, there is no central organizational focus for road safety personnel. Estimates in this chapter suggest that there are roughly 10,000 full-time road safety professionals in federal, state, and local government. They consist of experts from a wide range of disciplines. A much larger workforce—perhaps five to 10 times as large—contributes to road safety on a regular basis, even though many of these workers may not view their jobs as safety related.

Full-time road safety professionals require broad safety knowledge and training. The kinds of knowledge and skills required and how full-time safety professionals obtain safety training and education are considered in the next chapter. Consideration is also given to the safety-related knowledge and training needs of the many other workers who contribute to road safety. Although they are not full-time road safety professionals, their collective impact on road safety may be many times greater than that of the road safety professionals.

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USDOT	U.S. Department of Transportation

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Acquiring Road Safety Knowledge, Skills, and Abilities

In an influential paper, “The Road Ahead,” Ezra Hauer describes road safety professionals as “the purveyors of the factual road safety knowledge” who must inform the decisions of the much broader workforce that affects safety (Hauer 2005). Hauer contends that road safety management is transitioning from actions based on intuition, judgment, and tradition to those based on empirical evidence, science, and technology. He urges efforts to further this development, both through changes in practices in the field and through educating and training the workforce that influences road safety.

Understanding what safety-related knowledge and skills are required by the road safety workforce and how they are obtained is important in building the road safety profession and ensuring that the road safety workforce can make the transition described by Hauer. *NCHRP Research Results Digest 302* outlines a set of core competencies for road safety professionals (TRB 2006). Those competencies are examined in this chapter. A distinction is made between competencies applying to full-time road safety professionals and those that may apply to others in the public-sector workforce who influence safety.

A survey of course offerings by university engineering and public health programs was conducted as part of *NCHRP Research Results Digest 302*. Many transportation professionals are educated in schools of civil engineering. While many civil engineering graduates take positions in transportation planning, design, and operations, some pursue full-time careers in road safety management. University schools of public health are another source of road safety professionals. The findings of this survey are therefore reviewed, and consideration is given to how road safety knowledge and skills are acquired by workers through

other means, such as continuing education and on-the-job training and learning.

Hauer points out the important role of research in supporting the development of competent safety professionals. The results of research provide the factual knowledge for safety management, and research programs help attract and develop faculty expertise and support graduate students. The chapter therefore concludes with a brief review of road safety research programs in the United States.

CORE COMPETENCIES OF THE ROAD SAFETY PROFESSIONAL

Core competency statements that describe the baseline body of knowledge and skills required for a particular profession have been developed in such diverse fields as library sciences, teaching, psychiatry, emergency management, and public health. These statements have multiple purposes: they can help workers plan their professional development, guide educators and trainers in designing curricula and course content, and help employers establish job descriptions and performance measures for their workers. Professional societies often consult the core competencies when they develop certification programs and other credentialing standards.

NCHRP Research Results Digest 302 represents the first time that a core competency statement has been put forward for the road safety profession. The statement was developed over a 2-year period by educators, researchers, public officials, and leaders of industry and professional associations. The five core competencies are presented in Appendix B. Each consists of a set of knowledge and skills that the authors of the statement believe are required to perform effectively as a road safety professional. The competencies cover the knowledge and skills required to

1. Recognize the management of highway safety as a complex multidisciplinary system;
2. Understand the history of highway safety and the institutional settings in which safety management decisions are made;
3. Understand the origins and characteristics of traffic safety data and information systems to support safety management decisions;

4. Assess factors contributing to highway crashes, identify and implement potential countermeasures, and evaluate their effectiveness; and
5. Develop, implement, and administer a highway safety management program.

The first three items cover the core *knowledge* required for safety competency; they include basic safety facts and relationships, institutional responsibilities, and information and data sources. The final two cover basic *skills* that are required, including analysis, communications, and management. Box 4-1 offers a more detailed account of the body of knowledge and skills contained in the listing of core competencies and associated learning objectives set forth in *NCHRP Research Results Digest 302*.

As explained in *Research Results Digest 302*, mastery of the knowledge and skills covered in all five competencies is desirable for the full-time road safety professional and would presumably require many years of study and career development to achieve. Training in the core competencies, however, is also advantageous to others who are not full-time road safety professionals but whose work decisions and actions affect safety. For example, familiarity with the multidisciplinary nature of safety, the history and institutional setting of safety management, and the characteristics and use of crash data is desirable for all workers who contribute to road safety.

Like most professions, the road safety profession is becoming more reliant on technology. The tools that road safety professionals use to exercise their core competencies range from personal computers to intelligent transportation systems combining computing, sensing, communications, and control technologies. Road safety professionals must be adept in the use of new technologies to develop and implement all of the skills and abilities discussed above.

The mix of skills and abilities required of safety professionals will continue to change. Knowledge of marketing and consumer behavior, for example, is becoming more important in developing safety programs that influence the decisions of drivers, occupants, and pedestrians. An increasingly systems-level approach to road safety management will lead to a continued expansion of the body of knowledge and skills required for effective functioning in the road safety field. The statement of core

BOX 4-1

Core Body of Knowledge and Skills Required for Competency as a Road Safety Professional

Knowledge

All safety professionals should have an understanding of the following:

The involvement of multiple disciplines in safety management. Among the disciplines that must be called on to manage road safety are civil engineering, mechanical engineering, law enforcement, psychology, human factors, economics, statistics, education, systems analysis, organizational behavior, and marketing. The safety professional should be able to explain the roles of these disciplines in safety management (Competency 1a).

The importance of science-based research and its application in effective safety management. The road safety professional should appreciate how research and analysis can help in making more informed choices by clarifying issues, revealing inconsistencies in aims and efforts, generating alternatives, and helping translate ideas into effective safety policies and programs (Competency 1b).

The effects of economic, social, technological, and demographic trends on safety. The road safety professional should recognize that road safety is affected by many exogenous and dynamic trends that continually present new challenges to improving safety performance. The professional should be able to describe major trends that are ongoing and emerging and explain their potential effects on safety (Competency 1c).

The factors occurring before, during, and after a crash and involving the driver, the vehicle, the highway, and emergency response that affect crash incidence and severity. Road safety

professionals should be familiar with common classifications of highway crash and injury severity factors and their relationship to the crash event through the use of models such as the Haddon matrix. They should understand how contributing factors can interact (Competencies 1d, 1e, and 1i).

The combining of countermeasures from the four E's of traffic safety: engineering, enforcement, education, and emergency response. The road safety professional should be able to explain how measures from each of the four E's have yielded safety benefits, individually and in combination (Competencies 1g and 1h).

The institutional settings in which safety management decisions are made and the main public and private organizations that have safety responsibilities, information, and resources. All road safety professionals should understand the importance of collaboration among organizations and the barriers that can hinder collaboration. They should know the major legislation, historical figures, and stakeholder groups affecting safety goals, responsibilities, and investment decisions. They should be aware of other transportation priorities (e.g., congestion mitigation, environmental protection, economic development) that accompany safety (Competencies 1j, 1k, 2a, 2b, 2c, 2d, and 2e).

The main databases and information systems that can be used for safety management, including state, local, and national databases. The safety professional should know how to access safety-related data and information systems and have a working understanding of how the data are collected and their strengths and weaknesses (Competencies 3a, 3b, 3c, 3d, and 5f).

(continued on next page)

BOX 4-1 (continued)

Core Body of Knowledge and Skills Required for Competency as a Road Safety Professional

Skills

All safety professionals should have basic skills in analysis, management, and communications. The level of skill required will depend on specific job responsibilities.

Analysis All safety professionals should recognize and have a basic ability to access and interpret the results of the main scientific methods and statistical techniques used to identify safety problems, develop countermeasures, and evaluate safety countermeasures and programs (Competency 3e). More advanced skills are required of some professionals such as safety program analysts, planners, and developers. They should be able to use scientific methods and statistical techniques to identify current and potential safety problems, develop countermeasures and evaluate their effects, and present the results of complex analyses in ways that can be understood and used by decision makers (Competencies 4a, 4b, 4c, 4d, 4e, and 4f).

Communications All safety professionals should be able to communicate the importance of the use of data and scientific methods in managing safety (Competency 3f). A higher proficiency in communications is required for some safety professionals. Safety program managers should be able to communicate safety concepts and research results to a wide range of audiences from within and outside their organizations. They should have marketing and public relations skills to promote safety programs to the public and to decision makers (Competencies 5e and 5g).

Management Road safety professionals in management positions should be able to draw conclusions and establish plans and priorities on the basis safety research, analyses, and evaluations. They should be able to integrate safety into transportation plan-

ning processes (Competencies 5a and 5b). Safety program managers should be able to establish multidisciplinary and multiorganizational relationships to develop, plan, and implement safety programs. They should have the administrative, organizational, and financial skills to oversee safety programs and personnel from multiple disciplines and to build coalitions (Competencies 5d, 5e, and 5g).

Note: See Appendix B for the listing of competencies and learning objectives.

competencies, therefore, is best viewed as a foundation on which to build the education and development of road safety professionals. A follow-on project of the National Cooperative Highway Research Program (17-40) is under way that is seeking to develop model curricula based on the core competency framework in *Research Results Digest 302*.

CORE COMPETENCIES IN ENGINEERING AND PUBLIC HEALTH SCHOOLS

The authors of *Digest 302* surveyed 117 university engineering and 34 university public health programs to determine whether content pertaining to the core competencies is included in courses and curricula. Thirty-six universities (29 engineering and seven public health) responded to the survey. Table 4-1 summarizes the results. The survey revealed significant gaps in course coverage in all competency areas. Neither the engineering nor the public health programs covered all the knowledge-based learning objectives. Analytic skills received fair to good coverage in both engineering and public health curricula, but content concerning communications and management skills was limited.

The authors concluded that course offerings do not present road safety as a discipline; hence, important safety principles and scientific perspectives are missing from courses. They question whether students are receiving sufficient education in analytic techniques to perform effectively in safety management.

TABLE 4-1 Coverage of Core Competencies and Learning Objectives in Engineering and Public Health Schools

	Course Coverage Levels	
	Engineering	Public Health
Road Safety Knowledge		
Safety management is multidisciplinary	Modest	Modest
Science-based research is essential in safety management	Modest	Modest
Economic, social, technological, and demographic trends affect safety	Modest	Modest
Motor vehicle crashes have many contributing factors	Weak	Strong
Safety management requires countermeasures from the four E's	Modest	Modest
Institutional setting for safety management	Modest	Modest
Databases used for safety management	Modest	Modest
Road Safety Skills		
Analysis		
Ability to use traffic safety and public health data	Modest	Weak
Ability to use scientific methods to identify safety problems	Strong	Strong
Ability to evaluate safety program and countermeasure effectiveness	Modest	Weak
Communications		
Ability to communicate the importance of data for managing safety	Strong	Strong
Ability to reach out to the public for involvement in safety programs	Weak	Weak
Ability to explain opportunities for strategic communication of safety initiatives	Weak	Weak
Management		
Ability to use scientific management techniques for safety programs	Weak	Weak
Ability to establish multidisciplinary relationships	Weak	Weak

NOTE: Strong coverage = more than two-thirds of programs covered the topic; modest coverage = between one-third and two-thirds of programs covered the topic; weak coverage = less than one-third of programs covered the topic.

OTHER TRAINING AND EDUCATION OPPORTUNITIES

Because the road safety profession encompasses so many disciplines and occupations, there are many ways safety professionals are educated and trained. Engineering and public health schools are one source of training. Continuing education programs, short courses, and on-the-job learning are among the most common means.

The federal government provides continuing education and training courses through the Transportation Safety Institute (TSI) of the National Highway Traffic Safety Administration (NHTSA) and the National Highway Institute (NHI) of the Federal Highway Administration (FHWA). The safety-related courses are aimed primarily at federal, state, and local officials. TSI is the largest training program for new and mid-career safety professionals. TSI courses cover many areas of responsibility for safety professionals such as the enforcement of impaired driving laws; design and management of road safety programs; delivery of emergency medical services; and public information programs to encourage the use of safety belts, child safety seats, and motorcycle helmets. TSI also offers courses and workshops for safety professionals to gain and enhance particular skills relevant to safety, such as management (e.g., finance, program review, grant application), communications (media relations), and analysis (data analysis techniques, safety performance measures). However, one of TSI's main functions is administrative in nature—training federal, state, and local officials in how to manage federal 402 programs and how to meet the requirements of other NHTSA programs.

NHI, which is administered by FHWA's Office of Professional and Corporate Development, offers courses for federal, state, and local highway personnel. Courses cover engineering topics such as the safety effects of highway geometric features and work zone safety. NHI also offers courses aimed at exposing highway personnel to safety analysis skills. For example, a course on new approaches to road safety analysis teaches students various methods for identifying crash causes and selecting cost-effective safety remedies.

FHWA and NHTSA sponsor several other programs that help train federal, state, and local highway workers in safety. NHTSA has designed child passenger safety training courses for state departments of transportation and public safety. FHWA administers the Local Technical Assistance Program (LTAP), which is composed of a national network of technical centers in every state and in tribal governments. LTAP centers enable counties, cities, and towns to improve their roads and bridges by supplying them with a variety of training programs and workforce development services. Training sessions and materials cover safety-related topics such as crash analysis, roadside safety features, and work zone

safety. Each year more than 100,000 workers participate in the more than 4,000 training sessions offered at LTAP centers.

States, private industry, professional societies, nonprofit safety organizations, and industry trade associations also have roles in safety training. Operation Lifesaver, for example, provides law enforcement officers with training on highway–rail grade crossing safety analysis and investigation. Professional associations such as the International Municipal Signals Association, the Institute of Transportation Engineers, and the American Society of Civil Engineers develop certification standards and training material in specialized areas such as intersection control; roadside design; and roadway signs, markings, and lighting. In some cases, these training activities are partially supported by federal grants; for example, FHWA provides funding to the American Traffic Safety Services Association to educate and train technicians about safety practices through its Roadway Safety Training Institute.

The Governors Highway Safety Association offers a course for new safety representatives and their senior staff on program development, implementation, evaluation, and administration of the 402 program. However, the course is program-specific and not aimed at developing road safety expertise. Some state agencies provide their own safety education and training programs to employees or do so in partnership with universities and colleges. For example, the Maryland Department of Transportation's Highway Safety Office has designated the Center for Injury Research and Policy at Johns Hopkins University (JHU) as the Central Maryland Regional Safe Communities Center. JHU faculty provide safety training to state highway agency personnel and local officials managing regional traffic safety programs. Each year the Pennsylvania Department of Transportation partners with Pennsylvania State University to hold a Transportation Engineering and Safety Conference for the agency's engineering workforce. The Virginia Department of Transportation funds the Transportation Safety Training Center run by Old Dominion University. The center provides training to state and local highway and public safety personnel in accident investigation and traffic records analysis. Other state departments of transportation have similar (though not always ongoing) relationships with state universities, such as that of Texas with the Texas Transportation Institute, that of Iowa

with Iowa State University, and that of Michigan with the University of Michigan Transportation Research Institute (UMTRI).

State and local police departments across the country send officers to the Northwestern Center for Public Safety, which offers many short courses pertaining to traffic safety. Other training programs are available for particular specialties. An example is the University of North Florida's Institute of Police Technology and Management (IPTM). IPTM offers short courses to state and local police officers from across the country on topics such as selective traffic enforcement, crash investigation, DUI enforcement, and traffic engineering for police.

It is not clear whether the many training opportunities collectively provide the range of knowledge and skills needed by road safety professionals as outlined in the core competencies. Many of the training courses are designed to implement particular programs; for example, to instruct program administrators in compliance with the provisions and requirements of federal grant programs. Others focus on the use of specific safety countermeasures or techniques, such as work zone design and flagging. Much of the training is specific to a discipline as opposed to multidisciplinary. For the most part, the training has no theoretical underpinning. There is little assurance that the programs provide highway safety professionals with the knowledge and skills outlined in the core competencies.

Hauer expresses concern that the guidebooks, software programs, and reference documents often included in safety training programs are frequently short on fact-based information. The authors of *Research Results Digest 302* raise similar concerns with regard to the course material for engineering and public health school undergraduate and graduate programs. They observe that many courses use engineering texts and guidebooks that are not based on the latest peer-reviewed safety literature developed through science-based research.

RESEARCH TO INFORM SAFETY PROFESSIONALS

The enactment of federal highway safety legislation during the 1960s led to new safety institutions, regulations, and programs. Concurrently, federal and state governments invested heavily in the design and construction

of the Interstate highway system. This combination led to more government funding of safety research and to the establishment of new safety research programs.

A handful of state university transportation research centers were already in existence by the 1960s, including the Texas Transportation Institute at Texas A&M University and the Institute of Transportation Studies at the University of California. These centers began more safety research during the 1960s. Research at the Texas Transportation Institute, for example, led to many improvements in roadside barriers, crash cushions, and breakaway sign and light supports. Other transportation university research centers were established during the decade, typically as a result of state legislation. In 1955 the state of Michigan established a highway traffic safety center at Michigan State University. By 1960, the center had more than 20 professional staff for instruction and demonstration programs. Without dedicated sources of funding, however, the center was unable to sustain these programs for more than a few years. UMTRI was subsequently created in 1965 with assistance from the automobile industry. UMTRI's road safety research model, concentrating on driver and vehicle research, proved to be sustainable and has not included instructional programs targeted to the safety workforce. The University of North Carolina Highway Safety Research Center was established by the state legislature in the same year, and the Pennsylvania Transportation Institute was established 3 years later. These research institutes were intended to provide a multidisciplinary approach to safety research, drawing experts from fields such as psychology, human factors, biomechanics, engineering, planning, and economics. In addition, important safety research was being undertaken in many other universities across the country.

Much of the research performed at the universities was sponsored by federal and state agencies. In addition, the government agencies conducted safety research at their own research and test centers and through private contractors. NHTSA, for example, funded research on alcohol and driver performance, the effects of driver education programs, technologies to improve vehicle crashworthiness, and crash causation factors. FHWA initiated multiyear research programs on wet weather crashes, roadside safety, and large-truck safety. Many states also sponsored and

performed safety research. The California Department of Motor Vehicles conducted pioneering studies of the relationship between driver characteristics and crash propensity. By devoting a percentage of their federal-aid funds to R&D, state highway agencies spent millions of dollars each year on highway research. A portion of this money went to safety studies on topics such as roadside safety hardware and paving materials for improved skid resistance. Government-funded research was accompanied by a growing body of safety research from the private sector, including work by the insurance industry and automobile makers on topics such as vehicle crashworthiness, driver performance, and biomechanics.

One gauge of the increased attention to safety in highway research is the historical index of publications by the Transportation Research Board (TRB). From its beginning as the Highway Research Board in 1921, TRB has been the primary outlet for highway engineering research. From 1921 to 1949, only 1.7 percent of TRB publications were safety related. From 1950 to 1965, this share increased slightly to 2 percent. Between 1966 and 1976, 7 percent of all publications were safety related, and since the late 1970s, this percentage has always exceeded 10 percent. Also evident from a review of the safety literature is that the topics of research were changing over time and including more disciplines such as epidemiology, emergency medicine, and pharmacology. In particular, the influence of injury prevention and control programs and supporting research in areas such as safety belt use, drinking and driving countermeasures, and pedestrian safety is visible. During the late 1980s an Injury Control and Prevention Center was created in the Centers for Disease Control and Prevention (CDC), which had developed strong relationships with state health departments and an emphasis on research rather than regulation. CDC established university-based research centers, which provided another source of road safety research.

The largest university research program of the U.S. Department of Transportation (USDOT) is the University Transportation Centers (UTC) program. According to USDOT, the mission of the program is to conduct basic and applied research to advance the body of knowledge in transportation, provide educational opportunities to expand the transportation workforce, and provide capacity-building programs to transportation professionals (USDOT 2006, 122). Begun in 1987, the program

is now managed by the Research and Innovative Technology Administration and funded by FHWA and the Federal Transit Administration. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) increased the annual funding for UTCs and nearly doubled their number to 60 (with 40 named in the legislation). Each UTC has a specific transportation theme or is in the process of proposing one. A review of the themes¹ indicates that more than a dozen centers are making or intend to make transportation safety a central element of their program. The committee did not review the UTC program but recognizes that it is perceived by many to be an underutilized resource for meeting transportation research and workforce development needs (USDOT 2006, 125). The program has the potential to be one of the means by which highway safety professionals are educated and trained in a multidisciplinary manner and exposed to the results of safety research.

Safety research contributes to the development of the road safety profession. The research process itself is important in attracting students and young professionals to the safety field. The insights and factual knowledge gained from research are essential in informing the safety professional and providing the factual basis for the guidebooks, standards, and other reference materials used in safety management. How effective this research has been in attracting students to the safety profession; generating science-based facts; and influencing the policies, guidebooks, and other reference materials commonly used by safety professionals is unclear. Many widely used reference documents, as Hauer has indicated, do not exhibit this influence. However, there is an apparent trend in the direction of fact-based safety management, of which Hauer approves. For example, research demonstrating the beneficial effect of graduated licensing for teenagers has prompted many states to adopt graduated licensing programs. A new *Highway Safety Manual* is being developed through a process giving explicit consideration to peer-reviewed safety research results as the basis for safety guidance. More generally, SAFETEA-LU has emphasized the development and use of data for safety planning and programming.

¹ See utc.dot.gov/themes.html.

Hauer contends that the public sector has the responsibility to create a long-term stable demand for road safety research, which in turn will support the development of a well-trained safety workforce. This and other challenges to creating the demand for and building the supply of road safety professionals are considered further in the next chapter.

SUMMARY

The baseline safety-related knowledge and skills required by road safety professionals have recently been outlined in a statement of core competencies. The statement should prove helpful to workers planning their professional development, educators and trainers designing curricula and course content, and employers establishing job descriptions and performance assessments.

Currently, no comprehensive education and training programs cover the core competencies. For the most part, education and training opportunities are disconnected from one another and from the safety research community. Whereas safety research is often undertaken in a multidisciplinary manner, education and training tend to be oriented toward a discipline. Most university civil engineering and public health programs do not present safety itself as a discipline, and consequently important safety principles and scientific methods are missing from course content. Similarly, continuing education programs, short courses, and on-the-job training opportunities are designed to cover specific safety topics, program requirements, and skills. While there are many such training opportunities, they are not structured in a way that enables workers to progress on a path of safety career development. Multidisciplinary training and education may help partners in road safety management from different fields, such as highway engineering, public health, and enforcement, overcome the political and institutional barriers to the development of a systems-oriented approach to safety management.

Safety research is vital in training and informing safety professionals. The creation of a long-term and stable demand for safety research has proved challenging but is essential in meeting future demand for competent safety professionals.

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TRB Transportation Research Board
USDOT U.S. Department of Transportation

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Summary Assessment and Recommendations

In this chapter, the committee summarizes its key findings, draws conclusions from them, and makes a series of recommendations aimed at building and advancing the road safety profession.

KEY FINDINGS AND CONCLUSIONS

Road Safety Is a Major Responsibility of Governments at All Levels

More than 40,000 people die each year in motor vehicle crashes in the United States. More than 2 million are injured each year. Reducing this toll is a major goal of governments at all levels. Since the 1960s, the number of fatalities per mile driven has fallen by 75 percent owing to a combination of public- and private-sector responses to improve the performance of drivers, motor vehicles, the roadway environment, and postcrash emergency response and trauma care. However, the scope of the problem continues to be immense, and crashes are the leading cause of death among children and young adults. Continued growth in motor vehicle travel means that larger and larger improvements in crash rates are needed to produce any reduction in the total number of people killed and injured in crashes each year. Yet improvements in crash rates in the United States have been lagging behind those of many other developed countries.

The public sector has a leading role in furthering road safety. Together, federal, state, and local agencies plan, design, build, operate, and maintain the highway system. They regulate motor vehicle safety features, educate and license drivers, fund and manage safety research, and establish

and enforce traffic laws. They provide emergency response and medical services. Yet 50 years ago, finding officials in these agencies with a job title or description emphasizing road safety would have been difficult. For the most part, safety management was viewed as a secondary responsibility of other professions.

Today, the mission statements of these public agencies indicate that virtually all give prominence to safety. Since the 1960s a number of agencies and offices dedicated to road safety have been created at the federal, state, and local levels, such as the National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) in the federal government and offices of the governor's highway safety representative in all states. The many public agencies that have key safety responsibilities are dispersed widely, both within and across jurisdictions. Such decentralization and fragmentation have long presented a challenge to concerted safety management and to a road safety workforce that is also scattered.

Road Safety Management Must Be Guided by Science and a Safe System Perspective

Government interventions have had a significant impact on traffic safety. Federal and state laws, policies, and programs aimed at increasing the use of safety belts, reducing impaired driving, and improving the design of vehicles and roadways have been especially beneficial. Although many of these actions are now accepted, most took years to bring about. Many had to overcome institutional, political, legal, and technical barriers. Underlying this success has been a changing view of the nature of motor vehicle crashes. Once viewed as random or "accidental" events, they are now seen as more predictable and susceptible to interventions. In progressive public agencies today, road safety is managed with greater reliance on empirical evidence, statistical analyses, and scientific methods and less on tradition, convention, and intuition.

A process has emerged whereby agencies employing expertise from multiple disciplines carry out a cycle of research, dissemination of results, and deployment and evaluation of countermeasures. Scientific methods and empirical evidence are central to the work carried out by these safety professionals. There is increasing recognition of the impor-

tance of managing safety at a systems level as opposed to focusing on the specific elements of the driver, the vehicle, and the highway. In the safe system approach all factors influencing safety are considered in an integrated manner and safety performance is closely monitored by road safety professionals.

Road Safety Management Requires a Talented and Diverse Workforce

The transition to a scientific and systems-level approach to road safety management has been led by a relatively small group of multidisciplinary professionals. Once dominated by traffic engineers and traffic police, the road safety profession has been transformed by the presence of economists, statisticians, planners, psychologists, epidemiologists, policy analysts, mechanical engineers, and others. This diversity of expertise has come to characterize the road safety workforce, with each discipline bringing different sets of skills and perspectives to achieve shared safety goals.

Nearly 10,000 professionals in federal, state, and local agencies are estimated to work full-time in road safety management. A workforce several times as large, on the order of 100,000 workers, regularly influences road safety. The size of the workforce is modest in light of the large number of government agencies that have safety responsibilities. Nationally, there are well over 10,000 such agencies, which means that road safety professionals account for a small fraction of the total workforce of public agencies with influence on and responsibility for safety. Most state departments of transportation employ four to five times as many environmental analysts and planners as they do full-time safety professionals, in part because of the need to comply with the requirements of federal and state environmental laws and regulations. In contrast, most local highway agencies do not employ a single full-time safety specialist.

Road Safety Professionals Must Possess a Common Body of Knowledge and Skills

Because they are few in number in most public agencies, road safety professionals must apply their knowledge and skills effectively. In many cases, they are expected not only to provide technical safety expertise within their respective agencies but also to serve as effective advocates for

safety in all agency decisions and to mentor the larger number of workers who regularly influence safety. To perform competently, road safety professionals must have an understanding of the safety roles of engineering, enforcement, education, and emergency response; the institutional setting for safety management; and the data and information systems available to support safety decisions.

The extent to which the nation's road safety professionals possess relevant safety-related knowledge and skills could not be assessed in this study. However, most appear to have relied on on-the-job learning after migrating into the road safety workforce from other disciplines. Many safety professionals entered the field during the 1960s and 1970s, following federal highway safety legislation and program expansions. For most of these workers, safety expertise was obtained through work experience and from continuing education and periodic training opportunities during the course of their careers. While such opportunities exist for road safety education and training on discrete topics, there are no programs offering comprehensive training in road safety management.

For the larger population of workers who influence road safety, the opportunity for safety training and education is even more limited. Although they do not require the same breadth and depth of safety-related knowledge and abilities as full-time safety professionals, a shared understanding of safety concepts and methods is essential in pursuing a systems-level approach to safety management.

Education and Training Opportunities for Road Safety Are Scarce

Some diversity in the means by which road safety professionals gain their safety-related knowledge and expertise is to be expected. However, the absence of more comprehensive road safety education and training programs can have drawbacks in, among other things, building up the workforce quickly, attracting students and young professionals to the field, and recruiting to fill positions. A survey of the curricula and course content of university engineering and public health programs suggests that they are not playing a major role in instilling safety-related knowledge and skills in the road safety workforce. Safety-related content is spotty in both undergraduate and graduate programs, and no program provides

a comprehensive basis for competency in road safety management. Reference material for supporting road safety curricula is lacking.

Until recently, even an outline of the core body of knowledge required for competency in the profession has been missing. Without it, there has been no good way to identify strengths and deficiencies in the knowledge of the safety workforce. Employers have been limited in developing job descriptions, assessing worker qualifications and performance, and identifying the expertise required for effective road safety management at the organizational level. Students and young workers have lacked an overarching description of the requirements of the profession, which would be helpful for career preparation and development. Education and training institutes have had little to guide them in structuring comprehensive road safety management curricula. The committee believes that the statement of *NCHRP Research Results Digest 302: Core Competencies for Highway Safety Professionals*, released in May 2006, could begin to meet many of these needs, both in its current form and after refinement.

Career Advancement in the Road Safety Profession Is Limited

Although entire agencies, such as NHTSA and FMCSA, have safety as their primary mission and employ hundreds of full-time safety professionals, the organizational charts of state transportation departments, motor vehicle administrations, planning organizations, public health departments, county road commissions, and state highway patrols contain few top management positions with safety in the title. While some of these agencies have safety offices or divisions, their leaders rarely have safety backgrounds or career paths that progressed through safety units.

Findings from panels of agency executives, human resource administrators, and safety professionals that were convened for this study suggest that the road safety profession has offered a limited career path that has hindered recruitment. The treatment of safety as an adjunct of other professions such as traffic engineering, education, and law enforcement; the absence of professional associations and comprehensive education and training programs; and the multidisciplinary nature of safety management have contributed to this outcome. Attracting students and young professionals to safety positions in public agencies will require active recruitment and evidence that these positions offer the prospect of career

advancement within the organization. A better understanding of the factors influencing career selection and the strengths and weaknesses of the road safety field with respect to these factors is required.

The Need for Road Safety Professionals Is Growing

The United States, like most industrialized nations, faces a challenge in maintaining a downward trend in motor vehicle fatalities as travel increases. Road safety professionals will require a better understanding of the factors contributing to crashes and their severity, innovative and scientific approaches to finding and evaluating solutions, and greater sophistication in implementing these solutions. The safe system approach also requires application of strategic management skills. Thus, the road safety profession is likely to encompass even more disciplines, which will create an even greater challenge in developing and maintaining a core of full-time professionals.

Public policies have begun to recognize the importance of furthering science-based and strategic approaches to road safety management. In passing the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, Congress demanded that state and local governments engage in more rational road safety planning and programming. These requirements fit together with other developments taking place in the field that will require an increasingly skilled, analytical, and knowledgeable safety workforce to implement. Not since the passage of landmark highway safety legislation during the 1960s have so many new and challenging demands been placed on the nation's road safety workforce.

More Attention Must Be Given to Building the Supply of Safety Professionals

An increase in demand for road safety professionals is desirable. Whether this demand can be met in a timely manner is open to question. Reliance on the traditional informal approach to developing the workforce runs the risk that many workers will enter the field with limited skills and will depend largely on on-the-job learning to obtain them. The combination of knowledge, skills, and behaviors required to function effectively in the

road safety profession is complex, as reflected in the *Core Competencies for Highway Safety Professionals*.

In many respects, the development of the core competencies has brought greater attention to the risk inherent in expecting the road safety profession to develop in the traditional manner, especially with rising demand. Workforce development takes time. Accordingly, early actions to build the supply of road safety professionals have the greatest potential for ensuring that the demand for qualified professionals can be met. With this timeliness in mind, the committee recommends the following actions.

RECOMMENDED ACTIONS

The road safety profession is dispersed widely among thousands of public agencies. The agencies have a common interest in building the supply of safety professionals, but they lack a collective voice to further this interest. There is little question that the road safety workforce will need to grow in numbers and skill to meet the public's demand for safety progress.

The field has evolved significantly but through processes that are not well suited to meet growing demands and expectations. Road safety professionals are developed today much as they were a generation ago, largely through on-the-job experience, and comprehensive road safety education programs, training opportunities, and professional associations are scarce. As a result, the supply of safety professionals equipped for careers pursuing science-based and systems-level safety programs cannot be increased quickly. Building the supply will require actions that attract students and young professionals to the field and provide career development opportunities for existing road safety professionals. All public agencies with road safety responsibility have an interest in bringing about such change. By working together, they have a better chance of succeeding.

The American Association of State Highway and Transportation Officials and the Governors Highway Safety Association Should Forge a Broad-Based Alliance to Advance the Road Safety Profession

The committee recommends the creation of a broad-based alliance to advance the road safety profession. States and their national associations

are urged to take the first steps in forging this alliance, which must involve organizations with a strong interest in road safety across the public sector, private industry, and academia.

State governments have responsibilities that affect all aspects of road safety. They plan, design, build, operate, and maintain large portions of the highway infrastructure; pass and enforce traffic safety laws; regulate driver instruction and licensing; and administer statewide programs aimed at encouraging safe driving behavior. States employ thousands of road safety professionals and must have a central role in any effort to develop the profession. The two national associations with state members who are responsible for many of these safety-related functions are the American Association of State Highway and Transportation Officials (AASHTO) and the Governors Highway Safety Association (GHSA). In the committee's view, these two associations are logical entities to take the lead in constructing a partnership of organizations to advance the road safety profession. **Accordingly, the committee urges AASHTO and GHSA to begin the process of forging a broad-based alliance to advance the road safety profession.**

To be effective, the alliance must have influential members from federal, state, and local agencies and associations as well as the private sector and academia. AASHTO and GHSA are capable of identifying and urging the participation of the many entities that should be active members. From the federal government, the Federal Highway Administration, NHTSA, FMCSA, and the Centers for Disease Control and Prevention (CDC) are logical candidates. Associations representing other state agencies and local governments, including the American Association of Motor Vehicle Administrators, the American Association of Metropolitan Planning Organizations, the American Public Works Association, Local Technical Assistance Program Centers, the National Association of Regional Councils, and the National Association of County Engineers, are similarly desirable participants. The participation of national associations of local governments is especially important because of the role of counties, municipalities, and towns in ensuring road safety.

The committee urges that efforts be made to involve national organizations representing the enforcement community, such as the International Association of Chiefs of Police and the Commercial Vehicle Safety

Alliance, as well as the transportation profession and University Transportation Centers, which are well represented by the Institute of Transportation Engineers, the Transportation and Development Institute of the American Society of Civil Engineers, the American Society of Safety Engineers, the Council of University Transportation Centers, the American Planning Association, the Human Factors and Ergonomics Society, and the Society for Advancement of Violence and Injury Research. The alliance should also seek the support of private-sector organizations and associations that have an interest in building the road safety workforce.

The Alliance Should Champion the Road Safety Profession on Multiple Fronts

The committee envisions an alliance whose activities and actions will help meet current workforce needs and foster the development of the profession over the longer term. The alliance should take the following actions:

- **Promote a multidisciplinary road safety workforce that recognizes the importance of and is capable of applying a science-based and systems-level approach to safety management.**
- **Commend and publicize public agencies that are leading the way in recruiting, developing, and sustaining a professional road safety workforce,** including those providing comprehensive education and training opportunities and desirable career paths for safety professionals.
- **Encourage the continued development and more widespread use of core competency definitions to guide the education, training, and promotion of road safety professionals.** The alliance can encourage the use of core competencies for developing comprehensive, science-based, and multidisciplinary education and training programs; establishing job and career path descriptions; assessing worker qualifications and job performance; and establishing the safety qualifications of personnel in procurement contracts.
- **Promote road safety management as a distinct profession and a desirable career path,** in particular by seeking the creation of a road safety professional society that supports professional development, explores

and promotes means of attracting students and young professionals to the field, encourages safety education and research, and facilitates the exchange of information among road safety professionals.

- **Persuade public agencies, industry, and universities of the value of forming education and training partnerships** that offer pragmatic experience to students and young professionals, attract qualified students to the safety field, and provide an avenue for science-based safety methods to become standard practice in the field.
- **Advocate support for science-based safety research** to inform road safety professionals and to attract top faculty and students to the field from many disciplines. The alliance could seek the creation of scholarships, internships, training grants, endowed university chairs, and research centers across the disciplines contributing to road safety.

The alliance should take a leadership role in advancing these goals. **In particular, the alliance should urge all states to take advantage of federal workforce training funds for the purpose of developing road safety professionals.** SAFETEA-LU raised the stature of road safety by establishing highway safety improvement as a core program, tied to strategic safety planning and performance. The act allows states to use federal funds for workforce training and other educational activities; however, it does not contain directives or guidance on using the available funds for safety-related training. Following through on the safety planning and implementation requirements of SAFETEA-LU will require a well-trained road safety workforce. The alliance can bring greater attention to this need and encourage states to devote sufficient training funds to meeting it.

As documented in this study, road safety education and training opportunities are fragmented, and no comprehensive programs are available for students and safety workers. The alliance should seek to bring about more comprehensive and multidisciplinary road safety education and training programs. **In particular, the alliance should advocate road safety education and training by universities and publicly funded safety research institutions.** Many universities have strong safety research programs but limited instructional programs tied to this research. An emphasis on coupling research with technology transfer, education, and training is desirable. For example, the committee observes that the

University Transportation Centers, funded in part by the U.S. Department of Transportation, and the Injury Control Research Centers, funded in part by CDC, can play stronger roles in road safety education and training.

Overcoming the lack of comprehensive road safety education and training programs covering the core competencies may require additional steps. **The alliance could explore the establishment of one or more specialized education and training institutes to provide comprehensive instruction and training for road safety professionals.** The curricula and course content should be based on the core competencies and make use of affordable and accessible means of instruction, including distance-based learning. If a compelling case can be made, the alliance may examine ways to create such institutes, perhaps through the pooling of resources by public agencies with road safety responsibility.

As highway technologies change, new challenges will emerge requiring the expertise of safety professionals. The technologies themselves may offer new tools and resources for safety management. For example, intelligent transportation systems may introduce new technologies that affect safety directly and provide new capabilities for road safety monitoring and evaluation. The alliance will be in a good position to monitor the effect of technological change on demand for road safety professionals and on the opportunities to apply technology to improve safety.

CONCLUDING OBSERVATIONS

Most technical fields have become increasingly professional in character. They are accompanied by degree-granting programs, certification and credentialing processes, professional societies, and a defining core body of knowledge and skills. While road safety management has been heading in the same general direction, it has lacked many of these features. One reason for this situation may be that road safety management is multidisciplinary and the workforce is spread among many organizations having a wide range of perspectives, roles, and responsibilities.

The safety problem is highly complex and becoming more challenging. Hence, accelerating the professionalization of road safety management is, in the committee's view, necessary for continued safety progress. If the

recommended alliance of interest is created, it could draw attention to the need for professionalizing road safety management, which would advance the profession and its positive influence on safety. Federal, state, and local governments are becoming more aware of the need for science-based and systems-level approaches to safety management. The committee is confident that its recommendations are complementary to these goals and anticipates that they will be welcomed by the organizations urged to carry them out.

Agenda

August 2006 Committee Meeting and Workshop

Second Meeting

Committee for a Study of Supply and Demand for
Highway Safety Professionals in the Public Sector
August 10–11, 2006

National Academies Keck Center, Room 101
500 5th Street, NW, Washington, D.C.

Thursday, August 10

9:30 a.m. **Self-introductions**

Overview of study genesis and charge: chair, members,
sponsors
Goals and structure of panel discussion: chair and committee
members

10:00 a.m. **Panel of Road Safety Professionals**

Moderators: Thomas M. Welch, T. Bella Dinh-Zarr, and
Lowell M. Porter

Panelists:

Tom Bryer, Director (retired), Highway Safety and Traffic
Engineering, Pennsylvania Department of Transportation
James Champagne, Governor's Highway Safety Represent-
ative, Louisiana
Frank Cardimen, Traffic Improvement Association of
Oakland County, Michigan

Ann Dellinger, Motor Vehicle Injury Prevention Team,
Division of Unintentional Injury Prevention, Centers for
Disease Control and Prevention
Hugh McGee, Vanasse Hangen Brustlin, Inc.

1:00 p.m. **Panel of Educators**

Moderators: Paul P. Jovanis and Thomas J. Songer

Panelists:

Alexander Weiss, Director, Center for Public Safety,
Northwestern University

David Ragland, Director, University of California Traffic
Safety Center

Jackie Milani, Director, Community Outreach and Training,
Center for Injury Research and Policy, Johns Hopkins
University

Lindsay Griffin, Director (retired), Center for Transportation
Safety, Texas Transportation Institute

2:45 p.m. Break

3:00 p.m. **Panel of Human Resource Managers and Trainers**

Moderator: Susan B. Herbel

Panelists:

Shirley Licorish, Cambridge Systematics

Rick Barnaby, National Highway Institute

Kate Immordino, Assistant Commissioner for Administra-
tion, New Jersey Department of Transportation

4:45 p.m. Break

Friday, August 11

9:00 a.m. **Panel of Agency Executives**

Moderators: Kam K. Movassaghi and John H. Daly

Panelists:

Pete Rahn, Director, Missouri Department of Transportation

Charlie Howard, Director, Transportation Planning, Puget Sound Regional Council

Alexander Kelter, Chief (retired), Epidemiology and Prevention for Injury Control Branch, California Department of Health Services

Marilena Amoni, Associate Administrator for Research and Program Development, Traffic Injury Control Programs, National Highway Traffic Safety Administration

Keith Magnusson, Deputy Director, Driver and Vehicle Services, North Dakota Department of Transportation

10:45 a.m. Break

11:00 a.m. **Plenary Discussion** (committee members, sponsors, all panelists)

Summary of Highway Safety Core Competencies from *NCHRP Research Results Digest 302*

CORE COMPETENCY 1

Understand the management of highway safety as a complex multi-disciplinary system.

Learning Objectives

Highway safety professionals should be able to

- a. Describe highway safety as a complex, interdisciplinary, multimodal discipline devoted to the avoidance and/or mitigation of fatalities, injuries, and crashes.
- b. Understand, value, and utilize science-based highway safety research and its application in highway safety.
- c. Describe the demographic trends underlying the need for comprehensive and integrated highway safety management (e.g., social, cultural, age, gender).
- d. Describe the classification of highway crash and injury severity factors and their relationship to the crash event (i.e., precrash, crash, and post-crash) by using models such as the Haddon Matrix.
- e. Identify how crash contributing factors interact.
- f. Explain how effective safety management can be used to prevent morbidity and mortality associated with crash events.
- g. Explain the “Four E’s” of traffic safety: engineering, education, enforcement, and emergency medical services.
- h. Recognize the effectiveness of combining countermeasures/interventions to achieve improvements in safety.

- i. Recognize how highway user decision making is influenced by highway design, transportation planning, traffic operations, and vehicle design.
- j. Recognize the barriers that hinder collaboration across and within institutions.
- k. Identify and demonstrate opportunities and the ability to improve safety through collaboration with individuals from diverse cultural, disciplinary, and educational backgrounds and institutions.

CORE COMPETENCY 2

Understand and be able to explain the history of highway safety and the institutional settings in which safety management decisions are made.

Learning Objectives

Highway safety professionals should be able to

- a. Understand the historical figures, benchmarks, and decisions underlying highway safety.
- b. Identify the safety aspects of major transportation legislation.
- c. List and describe the goals of interest groups with a stake in safety-related policy, legislation, and investment decisions.
- d. Describe the institutional roles and responsibilities within which safety is managed (e.g., local, regional, state, and federal government, transportation modes, and the private sector).
- e. Explain and provide examples of the importance of highway safety relative to other transportation priorities (e.g., congestion mitigation, environmental protection, air quality, economic prosperity).
- f. Identify the availability of current highway safety training and education programs.

CORE COMPETENCY 3

Understand the origins and characteristics of traffic safety data and information systems to support decisions using a data-driven approach in managing highway safety.

Learning Objectives

Highway safety professionals should be able to

- a. Describe state and local information systems and data elements that can be used for safety management (e.g., crash, roadway inventory, driver/vehicle registration, citation, hospital/EMS, surveys, operations data, etc.).
- b. Describe the specialized national databases available for safety management and how they address deficiencies in the systems above (e.g., FARS, GES, CVISN, and WISQARS).
- c. Describe the process by which crash data are collected, including constraints associated with accurate, reliable field data.
- d. For each of the information systems, describe strengths and weaknesses as well as opportunities for improvements (compliance with MMUCC and NEMSIS and automated collection methods).
- e. Access and use traffic safety and public health data systems for identifying and tracking crash trends, targeting high-risk groups, and planning programs at the national, state, and local levels.
- f. Describe the importance of using crash injury or fatality data to evaluate the implications of safety management actions, policies, and programs.

CORE COMPETENCY 4

Demonstrate the knowledge and skills to assess factors contributing to highway crashes, injuries, and fatalities, identify potential countermeasures linked to the contributing factors, apply countermeasures to user groups or sites with promise of crash and injury reduction, and implement and evaluate the effectiveness of the countermeasures.

Learning Objectives

Highway safety professionals should be able to

- a. Identify current and potential highway safety problems using suitable scientific methods (e.g., those controlling for regression-to-the-mean).

- b. Identify the linkages among human factors and behavior, vehicle design, roadway design, and the environment and their interactions with respect to identified crash problems.
- c. Identify effective countermeasures that address specific crash factors.
- d. Establish priorities for alternative interventions/countermeasures based upon their expected cost and effectiveness and select countermeasures to implement (e.g., utilizing current science-based research methods such as *NCHRP Report 500* series and NHTSA/FHWA *Highway Safety Guidelines*).
- e. Evaluate the effectiveness of the implemented intervention/countermeasure using appropriate statistical techniques in safety management [e.g., use of Empirical Bayes (EB) and/or case-control designs].
- f. Understand the importance of computing the expected safety benefit/cost associated with implementing a countermeasure as the difference between the crashes, fatalities, and injuries likely to occur with the countermeasure in place and the number of crashes, fatalities, and injuries expected to occur if the countermeasure were not implemented.

CORE COMPETENCY 5

Be able to develop, implement, and manage a highway safety management program.

Learning Objectives

Highway safety professionals should be able to

- a. Utilize scientific management techniques in planning, implementing, and evaluating highway safety programs.
- b. Identify strategies to integrate and amplify safety in transportation planning processes.
- c. Explain the need to provide leadership and funding for ongoing service/support enhancements such as professional development, staff education and training, upgraded computer hardware and software, and more.
- d. Establish multidisciplinary relationships necessary to support effective highway safety initiatives.

- e. Identify opportunities for internal and external coalition-building and strategic communications for highway safety initiatives.
- f. Identify sources of current research that support effective highway safety management (e.g., *NCHRP Report 501*, TRIS, *Accident Analysis and Prevention*, *Morbidity and Mortality Weekly Review*, SAE, *Injury Prevention*).
- g. Understand the value of leveraging resources for highway safety program implementation.
- h. Assess and promote effective outreach/public involvement program development and implementation.

Study Committee

Biographical Information

Kam K. Movassaghi, *Chair*, is President of C. H. Fenstermaker and Associates, Inc., in Lafayette, Louisiana. The company provides engineering and environment consulting services and is one of the largest surveying and mapping firms in the United States. He is also the President and CEO of Movassaghi Group, PEC, in Baton Rouge. Before taking these positions in 2004, he was Secretary of the Louisiana Department of Transportation and Development. During his 6 years of service as Secretary, he implemented a comprehensive management plan that emphasized the role of highway safety in investment decisions. He began his career as a design engineer in several civil engineering firms before joining the faculty at the University of Louisiana, Lafayette (formerly Southwestern Louisiana in Lafayette). He served as head of the Department of Civil Engineering at the university, where he expanded programs in research and developed a graduate engineering management program. He was a member of the Transportation Research Board's (TRB's) Executive Committee from 2003 to 2004. His awards and honors include the President Award of Merit, Louisiana Engineering Society (2004); Highway Safety Award, Louisiana Highway Safety Commission (2004); National Government Engineer of the Year, American Society of Civil Engineers (2002); Engineering Faculty Professionalism Award, Louisiana Engineering Society (1997); and Outstanding Civil Engineer of the Year, Louisiana Section of the American Society of Civil Engineers (1995). He is a member of the American Society of Civil Engineers, the Louisiana Engineering Society, Phi Kappa Phi, Chi Epsilon, and Sigma Xi. He received a bachelor of science degree from the University of Louisiana, Lafayette, in 1963 and earned a master of science degree and a PhD in civil engineering from Louisiana State University in 1965 and 1971, respectively.

John H. Daly is Manager Director of the Genesee County Road Commission in Flint, Michigan. In this capacity, he is the Chief Administrative Officer of the fifth-largest road construction and maintenance agency in Michigan. The commission administers 1,800 miles of highway and employs more than 200 people. Before joining the commission in 1999 he was City Manager of Three Rivers, Michigan, and Executive Director of the St. Joseph County Housing Rehabilitation Authority. He has also been Manager of Fayette, Ohio. He serves on the Board of Directors and is past President of the County Road Association of Michigan. He is a charter member of the Michigan Transportation Research Board and is active in the National Association of County Engineers. He retired from the U.S. Marine Corps. He earned a BA from Texas A&M University, an MS in systems management from the University of Southern California, an MS in systems technology from the U.S. Naval Postgraduate School, and a PhD in administration and management from Walden University, Minneapolis, Minnesota.

T. Bella Dinh-Zarr is Director of the North America Make Roads Safe Campaign. She was previously the National Director of Traffic Safety Policy for the American Automobile Association (AAA). She joined AAA in March 2002 as lead scientist and public spokesperson for the organization's traffic safety activities. She trained with the Cochrane Collaboration Injury Group in London and was a Centers for Disease Control and Prevention (CDC) Fellow and member of the CDC's motor vehicle team for the U.S. Guide to Community Preventive Services. She has been a Research Associate at the Texas Transportation Institute and a Scientist at the National Highway Traffic Safety Administration (NHTSA). Her research interests include seat belt policies, alcohol-related injuries, and senior mobility. She cochairs the Aging and Mobility Roundtable attended by leaders in the fields of transportation and aging and was a Presidential Appointee to the 2005 White House Conference on Aging Advisory Committee. She is a member of the TRB Committees on Safe Mobility of Older Persons, Occupant Protection, and Traffic Safety in Developing Countries. She was awarded the U.S. Department of Health and Human Services Secretary's Award, the CDC Outstanding Scientific Contribution to Public Health Award, and the NHTSA Recognition Award. She has a BA from Rice University and an MPH and a PhD in health policy

and injury prevention from the University of Texas School of Public Health.

Susan B. Herbel is Senior Associate for Cambridge Systematics, Inc. Her areas of expertise are transportation safety planning, program development, and evaluation. She has worked extensively on developing and implementing strategies associated with the Transportation Equity Act for the 21st Century requirement for integrating safety as a priority in the transportation planning process. She chairs the TRB Subcommittee on Highway Safety Workforce Development and the National Cooperative Highway Research Program panel that is developing benefit–cost analyses for human factors–oriented highway safety countermeasures. She is a member of the TRB Women’s Issues in Transportation Committee and Transportation Safety Management Committee. She formed the Network of Employers for Traffic Safety, a nonprofit organization that provides advice and consultation on employee safety to private companies and government agencies. She has a BA in political science from Kansas State University, an MPA from the University of Oklahoma, and a PhD in public policy from the University of Oklahoma.

Paul P. Jovanis is Professor in the Department of Civil and Environmental Engineering at the Pennsylvania State University, University Park, Pennsylvania. He was Department Head from 1997 to 2001. Before joining Penn State, he was Professor and Chair in the Department of Civil and Environmental Engineering at the University of California, Davis. He was Associate Director of the Institute of Transportation Studies at UC Davis from 1992 to 1997. He began his career on the faculty of Northwestern University. His main areas of safety-related research are in modeling accident occurrence, driver fatigue, the safety consequences and risk perception of in-vehicle technologies, and older driver mobility and safety. He holds a BE in electrical engineering from the Stevens Institute of Technology and a PhD in civil engineering from the University of California, Berkeley.

Lowell M. Porter is Director of the Washington Traffic Safety Commission (WTSC), which is responsible for coordinating and managing all government funding for traffic safety in Washington State. The commission funds traffic safety initiatives at the municipal, county, tribal,

and state levels and is responsible for compiling and analyzing traffic safety data on crashes, roadway engineering, and public health trends to support safety initiatives and legislation to improve traffic safety. As director of WTSC, he is the Governor's Highway Safety Representative to the U.S. Department of Transportation, NHTSA, and the Federal Motor Carrier Safety Administration. Before becoming director, he was Chief of the Washington State Patrol. He began his career as a state trooper in 1980. He earned a BA in business administration from City University, Washington State, and is completing course work for an MA from Gonzaga University.

H. Douglas Robertson retired in 2005 as Director of the Highway Safety Research Center at the University of North Carolina (UNC). He has extensive experience in transportation safety, engineering, and education. He was a Research Associate Professor in the Health Behavior and Health Education Department of the UNC School of Public Health and holds an adjunct faculty position with UNC's Department of City and Regional Planning. He is also an Inter-Institutional Adjunct faculty member in the Department of Civil, Construction, and Environmental Engineering at North Carolina State University. Having worked in the public and private sectors and academia, he has a broad perspective on past, present, and future transportation safety needs and services. He has served in numerous professional positions, including researcher, professor, vice president, and regional manager. He has a BS in civil engineering from Clemson University, an MS in transportation engineering from the University of South Carolina, and a PhD in civil engineering from the University of Maryland.

Thomas J. Songer is Assistant Professor of Epidemiology at the University of Pittsburgh's Graduate School of Public Health. He is also a faculty member of the University of Pittsburgh's Center for Injury Research and Control. His areas of research interest include medical conditions and motor vehicle injury, diabetes and motor vehicle crashes, and the medical costs of motor vehicle crashes. He is the principal investigator of several studies related to injury prevention in transportation. In one study, he is examining wheelchair use and injury risks in transportation settings. In another study, he is investigating motor vehicle crashes by persons

with Type 1 diabetes to examine crash risks and identify factors related to crashes. He has published papers in the *Journal of the American Medical Association*, *Risk Analysis*, the *American Journal of Preventive Medicine*, and *Diabetes Care*. He holds a bachelor's degree from the University of Notre Dame, a master's degree in public health from the University of Pittsburgh, and a PhD in epidemiology from the University of Pittsburgh. He also holds a master's degree in health planning and finance from the London School of Economics.

Peter F. Sweatman is Director of the University of Michigan Transportation Research Institute (UMTRI), a position he has held since September 2004. His expertise and research interests are in the areas of heavy vehicle interaction with infrastructure and highway infrastructure policy development. His work is widely recognized in the fields of vehicle design and engineering, vehicle and road safety, driver performance, and heavy vehicle standards and regulation. Before joining UMTRI, he was Founder and Managing Director of Roaduser Systems Pty., Ltd., of Australia. He was Chief Scientist at the Australian Road Research Board and Senior Fellow at the University of Melbourne. He was elected to the board of the Driver Education Centre of Australia and served as President of the International Forum for Road Transport Technology. He earned a BE and a PhD in mechanical engineering from the University of Melbourne.

Richard Tay is Professor and Research Chair for Road Safety in the Department of Civil Engineering and Adjunct Professor for Injury Prevention in the Department of Community Health Sciences at the University of Calgary in Alberta, Canada. He is also an Adjunct Professor in Road Safety at the Centre for Accident Research and Road Safety in the School of Psychology at Queensland University of Technology in Australia. He has extensive international experience in transport economics and policy and has lectured at Nanyang Technological University in Singapore, the Chinese University in Hong Kong, and Lincoln University in New Zealand. He was a visiting scholar at the Massachusetts Institute of Technology. His research and teaching involve the application of engineering, health, economics, marketing, psychology, and statistical models to analyze road crashes and evaluate road safety policies and programs as well as the development, implementation, and evaluation of

multidisciplinary measures to improve road safety. He has a BS in electrical engineering from Texas Tech University, an MS in engineering economic systems from Stanford University, and a PhD in economics from Purdue University.

Thomas M. Welch is the Chief Safety Engineer of the Iowa Department of Transportation and chairs the Iowa Safety Management System, which is a multidisciplinary and multiagency partnership of public- and private-sector entities concerned with highway safety. He also manages several other highway safety programs including the Iowa Department of Transportation Traffic Safety Research Program, highlighted by the Federal Highway Administration in its 2002 report on Best Practices in Highway Safety Programs. He has taught courses in highway design and transportation planning at Iowa State University. He is a member of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Highway Traffic Safety and the TRB Committees on Transportation Safety Management and Safety Data, Analysis, and Evaluation. He was awarded the 2004 AASHTO President's Special Award of Merit in recognition of "outstanding leadership, innovation and dedication to strategic highway safety initiatives in Iowa and across America." He has a BS in civil engineering from the University of Wisconsin and an MS in transportation engineering from Iowa State University.

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Susan Hanson, Landry University Professor of Geography, Graduate School of Geography, Clark University,
Worcester, Massachusetts

Adib K. Kanafani, Cahill Professor of Civil Engineering, University of California, Berkeley

Harold E. Linnenkohl, Commissioner, Georgia Department of Transportation, Atlanta

Michael D. Meyer, Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology,
Atlanta (Past Chair, 2006)

Michael R. Morris, Director of Transportation, North Central Texas Council of Governments, Arlington

John R. Njord, Executive Director, Utah Department of Transportation, Salt Lake City (Past Chair, 2005)

Pete K. Rahn, Director, Missouri Department of Transportation, Jefferson City

Sandra Rosenbloom, Professor of Planning, University of Arizona, Tucson

Tracy L. Rosser, Vice President, Corporate Traffic, Wal-Mart Stores, Inc., Bentonville, Arkansas

Rosa Clausell Rountree, Executive Director, Georgia State Road and Tollway Authority, Atlanta

Henry G. (Gerry) Schwartz, Jr., Senior Professor, Washington University, St. Louis, Missouri

C. Michael Walton, Ernest H. Cockrell Centennial Chair in Engineering, University of Texas, Austin
(Past Chair, 1991)

Steve Williams, Chairman and CEO, Maverick Transportation, Inc., Little Rock, Arkansas

Thad Allen (Adm., U.S. Coast Guard), Commandant, U.S. Coast Guard, Washington, D.C. (ex officio)

Thomas J. Barrett (Vice Adm., U.S. Coast Guard, ret.), Administrator, Pipeline and Hazardous Materials Safety
Administration, U.S. Department of Transportation (ex officio)

Joseph H. Boardman, Administrator, Federal Railroad Administration, U.S. Department of Transportation
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Rebecca M. Brewster, President and COO, American Transportation Research Institute, Smyrna, Georgia
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Paul R. Brubaker, Administrator, Research and Innovative Technology Administration, U.S. Department of
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John C. Stennis Space Center, Mississippi (ex officio)

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(Past Chair, 1992)

Nicole R. Nason, Administrator, National Highway Traffic Safety Administration, U.S. Department of
Transportation (ex officio)

Jeffrey N. Shane, Under Secretary for Policy, U.S. Department of Transportation (ex officio)

James S. Simpson, Administrator, Federal Transit Administration, U.S. Department of Transportation
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Carl A. Strock (Lt. Gen., U.S. Army), Chief of Engineers and Commanding General, U.S. Army Corps of
Engineers, Washington, D.C. (ex officio)

Robert A. Sturgell, Acting Administrator, Federal Aviation Administration, U.S. Department of Transportation
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*Membership as of October 2007.