

NEW TRB SPECIAL REPORT

The Relative Risks of School Travel

A National Perspective and Guidance for Local Community Risk Assessment

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School transportation safety is often synonymous with school bus safety—when people think about school transportation, they immediately think about school buses. Yet other travel modes—walking, bicycling, parents driving, teenagers driving, and public transit—account for more than half of all school trips.

Each travel mode has its risks, which vary from community to community and from school to school. However, school officials, parents, and students often do not consider the associated risks and choose or encourage the use of school travel modes for reasons apart from maximizing safety or minimizing risk—for example, for convenience, flexibility, or cost savings. But this is changing.

Recent congressional testimony has heightened interest in school transportation safety issues, as have reports and recommendations issued by the National Highway Traffic Safety Administration, the National Transportation Safety Board, and others. The 1996 U.S. Senate hearings on school transportation safety, for example, raised the question of the safety of children who use public transit to and from school. The focus of interest soon expanded to include other modes for transporting students.

The Transportation Equity Act for the 21st Century mandated that the Secretary of Transportation commission the Transportation Research Board (TRB) to examine the safety issues related to the transportation of school children to and from school and school-related activities by various modes. Through the National Research Council of the National Academies, TRB convened a Committee on School Transportation Safety (see box, page 42) to

◆ Review available injury, fatality, and exposure data; and

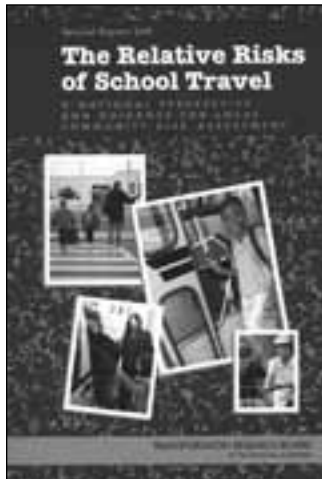
◆ Examine other related factors, including operating characteristics, vehicle design, and driver and passenger training.

The committee also was asked to assess the efficacy of drawing conclusions from the available data and—if the data were not available or were insufficient—to recommend a new data collection regimen and guidelines for implementation. *Special Report 269: The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment*, released in June 2002, presents an assessment of the relative risks of each major mode for school travel and provides insights on how changes in the distribution of school trips by mode may affect safety. This is the first study to present clearly the relative risks of the various modes, so that school officials, parents, and students can make informed decisions about how to get to and from school.

Goals and Approaches

The study committee's goal was to produce findings and recommendations that would have practical application to decision making about school travel safety. The committee adopted a two-part approach: a national-level statistical risk assessment of each travel mode and a set of risk mitigation checklists built from the peer-reviewed literature and accepted best practices. This framework allows communities to evaluate school travel alternatives systematically.

Because specific data for comparing the relative safety of narrowly defined individual travel modes are unavailable, insufficient, or inadequate, the committee grouped the modes for school travel into six categories with sufficient data to support the analyses:



Special Report 269, *The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment*, is available from TRB (see Publications Order Form in this issue).

- ◆ School buses, including regular and special education pupil transportation services;
- ◆ All other buses—transit, paratransit, and motor-coach service;
- ◆ Passenger vehicles—motor vehicles excluding school buses and other buses—with drivers at least 19 years old;
- ◆ Passenger vehicles with drivers less than 19 years old;
- ◆ Bicycles; and
- ◆ Walking.

Because data on trip purpose were not available for all modes, the analysis focused on deaths and injuries that occurred during normal school travel hours—6 a.m. to 8:59 a.m. and 2 p.m. to 4:59 p.m., weekdays, September 1 through June 30.

Data Sources

The data used in the analyses were extracted from three main sources:

- ◆ Nationwide Personal Transportation Survey (NPTS). Travel information was used to estimate the number of trips taken and the miles traveled by school-age children for all modes.
- ◆ Fatality Analysis Reporting System (FARS). Data on all police-reported fatal traffic crashes on public roadways in the United States were used to analyze student fatalities.
- ◆ General Estimates System (GES) of the National Automotive Sampling System. A nationally representative, stratified sample of data from police-reported traffic crashes on public roadways, involving property damage, injury, or death, was used to analyze student injuries. The data came from 60 geographic sites across the United States

Exposure to Risk

The NPTS dataset provided estimates of the total trips and distances traveled via each of the modes. The 1995 NPTS survey data show that school bus services accounted for 25 percent of trips and 28 percent of student-miles traveled during normal school travel hours. Other buses—typically but not exclusively transit buses—accounted for another 2 to 3 percent of school trips and of student miles during the same time periods. Trips by passenger vehicles, whether the driver was an adult or a teenager, represented about 60 percent of trips and two-thirds of student miles.

The distance traveled per trip varied by mode. For example, student pedestrian travel accounted for 12 percent of trips but represented only 1 percent of student-miles traveled. These differences are important in analyzing risk measures.

Injuries and Fatalities

Injuries and fatalities to children traveling to or from school are infrequent enough that a single year of data can be misleading. Therefore data from 9 years were combined.

Each year approximately 800 school-age children are killed in motor vehicle crashes during normal school travel hours. This represents about 14 percent of the 5,600 child deaths that occur annually on U.S. roadways and 2 percent of the nation's annual total of 40,000 motor vehicle deaths.

Of these 800 deaths, only about 20 (2 percent)—5 school bus passengers and 15 pedestrians—were school bus-related. Approximately 75 percent of the deaths in crashes occurred in the two passenger-vehicle categories. A disproportionate share of the passenger vehicle-related deaths (approximately 450 of the 800 deaths, or 55 percent) occurred with a teenage driver.

Finally, bicyclists and pedestrians accounted for 22 percent of student fatalities in crashes. Because of the limitations of the source databases, the statistics on student bicyclist and pedestrian crashes represent only accidents in which a motor vehicle was involved.

Approximately 152,000 school-age children are injured nonfatally during normal school travel hours each year. More than 80 percent (about 130,000) of these nonfatal injuries occur in passenger vehicles; only 4 percent (about 6,000) are school bus-related (about 5,500 school bus passengers and 500 pedestrians), 11 percent (about 16,500) occur to pedestrians and bicyclists, and fewer than 1 percent (500) are to passengers in other buses.

The injury estimates and fatality counts for school buses, other buses, and passenger vehicles with adult drivers fall below what would be expected from the exposure to risk implied in the number of trips taken or student-miles traveled. Conversely, injury estimates and fatality counts for passenger vehicles with teenage drivers, for bicycling, and for walking are disproportionately greater than expected. For example, passenger vehicles with teenage drivers accounted for more than half of the injuries and fatalities, a much greater proportion than the 14 to 16 percent that would be expected from the amount of student miles and number of trips.

Injury and Fatality Rates

By combining the estimated number of trips and student-miles traveled by mode with the injury and fatality data by mode, measures of risk can be developed to permit high-level comparisons of relative safety among modes. The highest rate of student injuries and fatalities per trip during normal school travel hours occurred for passenger vehicles with teenage drivers; the next highest rate was for student

cyclists. On a per-student-mile basis, however, school-age bicyclists have the highest injury and fatality rates, with school-age pedestrians next, and then students who travel in passenger vehicles with teenage drivers.

The fatality rates for passenger vehicles driven by teenagers were roughly 8 times higher than the rate for passenger vehicles driven by adults. School buses and other buses have the lowest injury and fatality rates. Figure 1 shows how uncertainty in the underlying data affects the estimates of risk for each mode.

Managing Risk

Assessments of the comparative safety of school travel modes and of the options to enhance safety must consider a range of factors: human, vehicular, operational, environmental, infrastructure-related, and societal. Policies at the local, state, and federal levels can control some of these factors; but others—such as age and gender—also must be considered when making policy decisions.

The large differences in risks to school-age children across travel modes suggest that some modes, in general, are safer than others. One approach to lowering the risks, therefore, would be to shift students from modes overrepresented in crashes (bicycling, walking, and passenger vehicles with teenage drivers) to modes that are underrepresented (school buses, other buses, and passenger vehicles with adult drivers).

Results from communities that have implemented specific risk mitigation programs, however, suggest that more can be done to reduce the risks of each of the travel modes. Programs designed to enhance the safety of particular modes—such as new passenger pick-up and drop-off locations at or near the school, enforcing bicycle helmet laws, and implementing and enforcing graduated driver licensing programs—also must be considered.

The risk assessment process developed by the committee combines quantitative estimates of travel mode risk with local student demographics and travel mode distributions to calculate the risk estimates for a school or region. Combining these quantitative risk assessment measures with the safety checklists creates a risk-management framework that can guide decision making on school travel safety.

The framework highlights the effects of changing the relative safety of a particular mode or of shifting students among modes. This can inform local decisions on such matters as school siting, student parking policies, and changes in the minimum walking distance, as well as allocation of available funds for infrastructure improvements.

The framework also can indicate instances in which policy changes to improve one aspect of safety inadvertently increase risks in other areas. However,

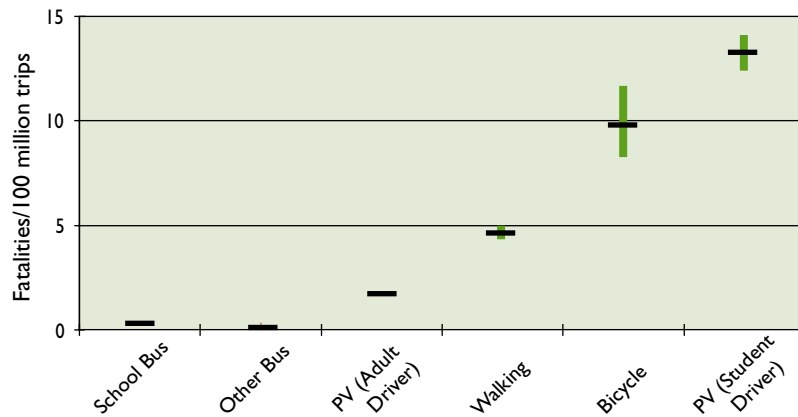


FIGURE 1 Student fatality rates per 100 million trips, by mode, during normal school travel hours, with 90 percent confidence intervals. (Note: Horizontal bars represent best estimates; PV = passenger vehicle.)

because the committee's findings are based on national averages and current modal experience, the risk reductions for a local school district implementing a specific risk-mitigation program cannot be determined precisely.

School transportation planners and policy makers at all levels should analyze transportation risks comprehensively in making decisions about school travel.

Application of the results of risk analyses reveals how decisions affecting one mode of school travel influence the risks to users of other modes. These decisions can affect overall risk significantly in ways that may not be obvious. The risk-management framework can highlight the importance and the implications of such choices.

The framework, however, should not stand alone. School transportation planners and policy makers also should take into account budget constraints, local conditions and values, local data, and judgments about the relative safety and cost-effectiveness of alternative policies.

Using a systematic risk-management framework, school districts should identify the most salient risk factors for the modes of school travel used by children in the community and identify approaches to manage and reduce those risks, including shifts to safer modes and safety improvements within each mode.

Each school district, and even schools within a district, will have different conditions and requirements that affect school travel risks and the choices that officials and parents make to reduce the risks. When resources permit, districts should support strategies that promote safety, as appropriate for the school or

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district. Districts also can adopt policies designed to support walking and bicycling to school to promote healthy lifestyles, after carefully assessing the adequacy of sidewalks, bicycle paths, crosswalks, and other infrastructure and safety measures, and making any necessary improvements.

The U.S. Department of Transportation (DOT) should disseminate information on the relative risks of using various modes of travel for school and school-related activities and on possible ways to mitigate the risks. U.S. DOT also should use this information to assess what role, if any, federal policy makers should have in efforts to improve the transportation safety of school children and the cost-effectiveness of specific safety measures.

State and local legislators, school boards, parent-teacher associations, private and religious schools, parents, students, and the media all play a role in decisions about school transportation. The national-level data presented in the report provide a starting point for decision making by highlighting the considerable differences in risk across modes of travel.

Local risk estimates will differ from these national estimates, however. School officials, state and local officials responsible for transportation facilities and operations, parents, and others need information on how to assess the adequacy of school transportation

systems, the relative risks and cost-effectiveness of various safety measures, and how to promote safety cost-effectively across and within modes.

Developing Databases

Many databases contain information related to transportation safety. Most of these databases, however, do not allow comparisons across modes for analyzing exposure to risk. Current data are illuminating, but incomplete.

Obtaining more thorough and complete data, however, can be costly. Of the large number of fatalities and injuries on highways in the United States, the proportion involving school-age children during normal school travel hours is relatively small. Therefore the benefits of additional data collection focusing on school travel should be carefully considered.

U.S. DOT and other agencies should examine and improve the compatibility and completeness of existing databases, to allow development of better risk estimates. To the extent possible, critical data elements—such as vehicle and roadway classifications—should be included and defined consistently in all the datasets.

The NPTS, FARS, and GES are the best available data sources but are not fully compatible because of differing variables, definitions, and classifications. U.S. DOT and other agencies should explore making the definitions and classifications consistent. This would enable development of more precise risk estimates.

U.S. DOT and appropriate agencies, in consultation with outside experts, should analyze the advisability and cost-effectiveness of establishing and maintaining any new database related to school transportation.

The committee encountered difficulties in estimating risk by mode for school travel. Moreover, estimating the risk of travel for school-related activities was not possible, because relevant data were lacking. However, the magnitude of the school transportation safety problem does not warrant major expenditures for new data collection—instead, cost-effective ways to collect new data with current structures should be explored and identified.

Improving Safety

Risk measures can be applied to analyze policy alternatives at state and local levels, and options can be implemented to reduce the risks to students who use the different modes. The goal is to improve safety for all children traveling to and from school and school-related activities and to provide communities with the information to make appropriate choices that balance needs and resources.