

# Recommendations to Reduce Injuries to Motor Vehicle Occupants

## Increasing Child Safety Seat Use, Increasing Safety Belt Use, and Reducing Alcohol-Impaired Driving

Task Force on Community Preventive Services

**Medical Subject Headings (MeSH):** accidents, traffic; alcohol drinking; motor vehicles; wounds and injuries; infant equipment; protective devices; seat belts; community health services; decision making; evidence-based medicine; economics; preventive health services; public health practice (Am J Prev Med 2001;21(4S):16–22)

### Introduction

Motor vehicle–related injuries kill more children and young adults than any other single cause in the United States,<sup>1,2</sup> and they are the leading cause of death from unintentional injury for persons of all ages.<sup>3,4</sup> More than 41,000 people in the United States die in motor vehicle crashes each year,<sup>5</sup> and another 3.5 million people sustain nonfatal injuries.<sup>1</sup> Moreover, crash injuries result in about 500,000 hospitalizations and 4 million emergency department visits annually.<sup>6</sup>

When crash injuries and deaths are viewed from a purely economic perspective, the burden to society is tremendous. Motor vehicle–related deaths and injuries cost the United States more than \$150 billion annually,<sup>7,8</sup> including \$52.1 billion in property damage, \$42.4 billion in lost productivity, and \$17 billion in medical expenses.<sup>7</sup> Alcohol-related crashes contribute substantially to these costs, with a direct economic impact of about \$45 billion in 1994 alone.<sup>7</sup>

Motor vehicle injury reduction remains a formidable public health challenge, despite the impressive declines in motor vehicle–related death rates achieved since 1925.<sup>9</sup> Child safety seats, safety belts, and deterrence of alcohol-impaired driving are among the most important preventive measures to further reduce motor vehicle occupant injuries and deaths.<sup>10,11</sup>

The recommendations in this report represent the work of the independent, nonfederal Task Force on Community Preventive Services (the Task Force). The Task Force is developing the *Guide to Community Preventive Services* (the *Community Guide*) with the support of

the U.S. Department of Health and Human Services (DHHS) in collaboration with public and private partners. The Centers for Disease Control and Prevention (CDC) provides staff support to the Task Force for development of the *Community Guide*.

This report provides recommendations on interventions to increase use of child safety seats, to increase use of safety belts, and to reduce alcohol-impaired driving. These areas were chosen because (1) use of child safety seats and use of safety belts are below national goals<sup>12</sup>; (2) 38% of traffic deaths involve alcohol<sup>5</sup>; and (3) not using child safety seats, not using safety belts, and alcohol-impaired driving are among the most important contributors to motor vehicle occupant injuries; reducing these three risk behaviors could dramatically reduce these injuries. These recommendations present evidence-based options appropriate for community, state, and national programs.

The Task Force recommendations are based primarily on the effectiveness of the intervention as determined by the systematic literature review process (described in the accompanying review articles).<sup>13–15</sup> In making its recommendations, the Task Force balances the information about effectiveness with information about other potential benefits and the potential harms of the intervention itself. The Task Force also considers the applicability of the intervention to various settings and populations in determining the scope of the intervention. Finally, the Task Force reviews economic analyses about effective interventions. Economic information is provided to assist the reader with decision making, but does not affect the Task Force's recommendation.

The specific methods for and results of the reviews of evidence on which these recommendations are based are provided in the accompanying articles.<sup>13–16</sup> General methods employed in evidence reviews for the *Community Guide* have been published previously.<sup>17</sup>

These recommended interventions can be used to

The names and affiliations of the Task Force members are listed on page v of this supplement, and at [www.thecommunityguide.org](http://www.thecommunityguide.org).

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**Table 1.** Selected *Healthy People 2010*<sup>12</sup> objectives and National Highway Traffic Safety Administration (NHTSA) goals related to motor vehicle occupant injury

<i>Healthy People 2010</i> objective	NHTSA goal
<b>General</b>	
Reduce deaths caused by motor vehicle crashes from 15.0 per 100,000 persons (1998 preliminary data, age adjusted to the year 2000 standard population) to 9.0. (Objective 15–15a)	Reduce the number of fatal and nonfatal injuries by 20% by the year 2008 (from 42,065 fatal and 3,511,000 nonfatal injuries in 1996). <sup>18</sup>
Reduce deaths from 2 per 100 million vehicle miles traveled (in 1997) to 1. (Objective 15–15b)	
Reduce nonfatal injuries caused by motor vehicle crashes from 1270 per 100,000 persons (in 1997) to 1000 (21% improvement). (Objective 15–17)	
<b>Child Safety Seat Use</b>	
Increase use of child restraint devices for passengers up to age 4 years, from 92% (1998 preliminary data) to 100%. (Objective 15–20)	Reduce child occupant fatalities (0–4 years) by 25% by 2005 (from 653 fatalities in 1996). <sup>19</sup>
<b>Safety Belt Use</b>	
Increase use of safety belts from 69% (in 1998) to 92% (33% improvement). (Objective 15–19)	Increase national seat belt use to 90% by 2005 (from 68% in 1996). <sup>19</sup>
<b>Alcohol-Impaired Driving</b>	
Reduce deaths caused by alcohol-related motor vehicle crashes from 6.1 per 100,000 persons (1997 baseline) to 4 per 100,000. (Objective 26–1a)	Reduce alcohol-related fatalities to no more than 11,000 annually by 2005 <sup>20</sup> (from 15,786 in 1999). <sup>5</sup>
Reduce injuries caused by alcohol-related motor vehicle crashes from 122 per 100,000 persons (1997 baseline) to 65 per 100,000. (Objective 26–1b)	
Reduce the proportion of adolescents who report that they rode, during the previous 30 days, with a driver who had been drinking alcohol, from 37% (in 1997) to 30%. (Objective 26–6)	
Extend administrative license revocation laws, or programs of equal effectiveness, for persons who drive under the influence of intoxicants, from 41 states (in 1998) to all states and the District of Columbia. (Objective 26–24)	
Extend legal requirement for maximum blood alcohol concentration levels of 0.08% for motor vehicle drivers aged $\geq 21$ years, from 16 states (in 1998) to all states and the District of Columbia. (Objective 26–25)	

achieve objectives set out in *Healthy People 2010*<sup>12</sup> and by the National Highway Traffic Safety Administration (Table 1).<sup>5,18–20</sup> In addition, the recommendations complement and add to information published by other groups. For example, the U.S. Preventive Services Task Force recommends counseling individual patients (including adults and parents of young children) to use occupant restraints (lap/shoulder safety belts and child safety seats), to wear helmets when riding motorcycles, and to refrain from driving while under the influence of alcohol or other drugs.<sup>21</sup> The American Academy of Pediatrics<sup>22,23</sup> (AAP; www.aap.org) suggests ways for pediatricians to implement office-based injury prevention counseling through The Injury Prevention Program (TIPP). The AAP also has model bills available, such as the Graduated Drivers' Licensing Act. The National Center for Injury Prevention and Control (Centers for Disease Control and Prevention) makes recommendations through the MMWR (Morbidity and Mortality Weekly Report; www.cdc.gov/mmwr/) on child safety seats, safety belts, and alcohol-impaired driving. Recommendations are also available from NHTSA,<sup>24</sup> the National Transpor-

tation Safety Board<sup>25</sup> (see also www.nts.gov), the American Medical Association,<sup>26</sup> and DHHS.<sup>12</sup>

## Intervention Recommendations

The Task Force evaluated the evidence of effectiveness of 13 selected interventions to address three strategies for reducing injuries to motor vehicle occupants (Table 2): increasing the use of child safety seats, increasing the use of safety belts, and reducing alcohol-impaired driving. (See Zaza et al.<sup>16</sup> for an explanation of how these interventions were selected.) Evaluations of additional interventions are still in progress.

### Interventions to Increase the Use of Child Safety Seats

Child safety seats can be extremely effective. When correctly installed and used, they reduce the risk of death by 70% for infants and by 47% to 54% for toddlers (aged 1–4 years) and reduce the need for hospitalization by 69% for children aged 4 years and

**Table 2.** Recommendations of the Task Force on Community Preventive Services for population-based interventions to reduce injuries to motor vehicle occupants

Intervention	Recommendation
<b>Increasing child safety seat use</b>	
Child safety seat laws	Strongly recommended
Community-wide information and enhanced enforcement campaigns	Recommended
Distribution and education programs	Strongly recommended
Incentive and education programs	Recommended
Education-only programs	Insufficient evidence
<b>Increasing safety belt use</b>	
Safety belt laws	Strongly recommended
Primary enforcement safety belt laws	Strongly recommended
Enhanced enforcement programs	Strongly recommended
<b>Reducing alcohol-impaired driving</b>	
.08% BAC laws	Strongly recommended
Lower BAC laws for young or inexperienced drivers	Recommended
Maintaining the minimum legal drinking age at 21 years	Strongly recommended
Sobriety checkpoints	Strongly recommended
Intervention training programs for servers of alcohol beverages	Recommended <sup>a</sup>

<sup>a</sup>Recommended when implemented as high-quality, face-to-face training, accompanied by strong management support.  
BAC, blood alcohol concentration

younger.<sup>27</sup> This section describes the Task Force's recommendations regarding five interventions designed to increase the use of child safety seats. A detailed review of the evidence for this section can be found in the accompanying article.<sup>13</sup>

**Child safety seat laws: Strongly recommended.** Child safety seat laws require children traveling in motor vehicles to be restrained in federally approved child restraint devices (e.g., infant or child safety seats) appropriate for the child's age and size. The state laws, which vary widely, also specify the children to whom the law applies by age, height, weight, or a combination of these factors. Child safety seat laws are strongly recommended based on their effectiveness in reducing fatal and nonfatal injuries and increasing child safety seat use throughout the United States. No harms or other potential benefits were reported and no qualifying economic information was identified from the literature.

**Community-wide information and enhanced enforcement campaigns: Recommended.** Community-wide information and enhanced enforcement campaigns seek to promote use of safety seats through the use of mass media, mailings, child safety seat displays in public sites, and special enforcement strategies such as checkpoints, dedicated law enforcement officials, or alternative penalties. These campaigns target their information and activities to an entire community, usually geographic in nature. Community-wide information and enhanced enforcement campaigns are recommended on the basis that they increase child safety seat use in a variety of populations and settings. No harms or other potential benefits were reported and no qualifying economic information was identified from the literature.

**Distribution and education programs: Strongly recommended.** Through distribution and education programs, approved child safety seats are given, lent, or rented at low cost to parents. All programs also include educational components of varying intensities. These programs target parents and other caregivers who might need assistance in acquiring a safety seat because of financial hardship or poor understanding of the importance of using child safety seats.

Distribution and education programs are strongly recommended on the basis that they increase child safety seat use when implemented (1) in a range of settings; (2) in a variety of population subgroups; and (3) as loan, rental, or giveaway programs. In addition, one study indicated a reduction in injury insurance claims among a population provided with safety seats by an automobile insurance company. No harms or other potential benefits were reported and no qualifying economic information was identified from the literature.

An important implementation issue regarding distribution and education programs has arisen since the studies in this review were conducted. Because the integrity of child safety seats can be compromised in a crash, seats returned to a distribution and education program should not be lent to others because there can be no guarantee that they were not involved in a crash. Therefore, when implementing child safety seat distribution and education programs, only new, unused seats should be provided to all recipients.

**Incentive and education programs: Recommended.** Incentive and education programs (1) provide children and parents with rewards and opportunities for rewards for the purchase and correct use of child safety seats, and (2) include educational components of varying

intensities. Incentive and education programs are recommended based on their effectiveness in increasing child safety seat use in a variety of populations and settings and using various reward systems. No harms or other potential benefits were reported and no qualifying economic information was identified from the literature.

**Education programs: Insufficient evidence.** Education programs provide information and teach skills to parents, children, or professional groups about the use of child safety seats. Information provides the basic foundation for moving people toward behavior change and can enhance skills, thus enabling behavior change. Providing information alone is rarely sufficient for sustained behavior change, but it is a central and necessary component of other interventions, such as community campaigns, distribution programs, and incentive programs.

The Task Force identified three qualifying studies that evaluated the effect of perinatal safety seat education programs on parents' later use of the seats for their children, one qualifying study evaluating the effect of a preschool education program on children's safety seat use, and two qualifying studies evaluating the effect of professional education on provider and system performance in health care systems and law enforcement, respectively. Therefore, on the basis of the (1) small number of available studies, and (2) variability in the interventions evaluated, insufficient evidence exists to assess the effectiveness of education programs alone in increasing child safety seat use.

### **Interventions to Increase the Use of Safety Belts**

Safety belt use is estimated to have saved 123,000 lives between 1975 and 1999. If all motor vehicle occupants consistently wore safety belts, it is estimated that an additional 9553 deaths would have been prevented in 1999 alone.<sup>28</sup> Lap and shoulder safety belts are the single most effective means for occupants to reduce the risk of death and serious injury in a crash. They have been shown to reduce deaths by 45% to 60%<sup>29-31</sup> and serious injury to the head, chest, and extremities by 50% to 83%.<sup>30</sup> Overall safety belt use in the United States is estimated to be 71%.<sup>32</sup> This section reports the Task Force's recommendations for three interventions to increase the use of safety belts. A detailed review of the evidence for this section can be found in the accompanying article.<sup>14</sup>

**Safety belt laws: Strongly recommended.** Safety belt laws require the use of safety belts by motor vehicle occupants. Specific requirements (e.g., age, seating position, fines, exceptions) vary by state. Safety belt laws are strongly recommended based on their effectiveness in increasing safety belt use and reducing fatal and nonfatal injuries among adolescents and adults. Several

studies indicated the additional benefit that laws requiring adult safety belt use also increase safety belt use by children. A potential harm of safety belt laws can be found in the theory that safety belt use will lead to other unsafe driving behaviors, thus neutralizing any beneficial effect that their use might confer. No studies reviewed, however, have shown an association between safety belt laws and increases in unsafe driving behaviors. No qualifying economic information was identified from the literature.

**Primary enforcement safety belt laws: Strongly recommended.** Primary enforcement safety belt laws allow a police officer to stop a vehicle solely for an observed belt law violation. The Task Force strongly recommends these laws over secondary enforcement laws, which allow a police officer to issue a belt law citation only if the vehicle has been stopped for another violation. The strong recommendation is based on the superior effectiveness of primary enforcement safety belt laws in increasing safety belt use and reducing fatal injuries compared with secondary enforcement safety belt laws in the United States. Potential harms and other positive effects considered are similar to those for safety belt laws in general. In addition, although differential enforcement based on race or ethnicity has been reported as a concern, studies that looked for evidence of such differential enforcement found none. No qualifying economic information was identified from the literature.

**Enhanced enforcement programs: Strongly recommended.** Enhanced enforcement programs provide increased rather than routine enforcement of safety belt laws at specific locations and times. These programs always include a publicity component. Enhanced enforcement programs are strongly recommended based on their effectiveness in increasing safety belt use and reducing fatal and nonfatal injuries in a wide range of settings and among various populations. One program reported increased corollary arrests as an additional benefit of an enhanced enforcement program. No harms were reported and no qualifying economic information was identified from the literature.

### **Interventions to Reduce Alcohol-Impaired Driving**

Alcohol-related motor vehicle crashes (i.e., those in which the driver had a blood alcohol concentration of at least 0.01 g/dL) resulted in 16,068 deaths and more than 300,000 injuries in 2000.<sup>33</sup> This section reports on the Task Force's recommendations regarding five interventions to reduce alcohol-impaired driving. A detailed review of the evidence for this section can be found in the accompanying article.<sup>15</sup>

**0.08% blood alcohol concentration laws: strongly recommended.** These laws establish the illegal blood alcohol concentration (BAC) of 0.08 g/dL for drivers aged 21 years and older (lower BAC levels are established for drivers 20 years old and younger). The 0.08% BAC laws are strongly recommended based on their effectiveness in reducing alcohol-related crash fatalities in the United States. No harms or other potential benefits were reported and no qualifying economic information was identified from the literature.

**Laws that establish a lower BAC level for young and inexperienced drivers: recommended.** These laws establish a lower BAC level for young or inexperienced drivers than for older or more experienced drivers, making it illegal for the persons targeted by the law to drive with a BAC above the established limit. In the United States, the limit is 0.02% or lower, and these laws apply to all persons under the age of 21 years (the minimum legal drinking age [MLDA] in all states). In other countries, these laws apply to either newly licensed drivers or newly licensed drivers under a specified age. The Task Force recommends laws establishing a lower legal BAC for young or inexperienced drivers based on their effectiveness in reducing alcohol-related crashes in the United States and Australia. A potential harmful effect of these laws is that young drivers whose BACs exceed the legal limit for adult drivers (0.08 g/dL or 0.10 g/dL) may receive “zero tolerance” citations instead of being arrested for the more serious offense of driving under the influence of alcohol. One study reported an estimated benefit-to-cost ratio of \$11 per dollar invested for lower legal BAC limits for young drivers.

**Maintaining the minimum legal drinking age at 21 years: strongly recommended.** MLDA laws specify an age below which the purchase and consumption of alcoholic beverages are not permitted. This review examined the effect of raising or lowering the MLDA. All states currently have an MLDA of 21 years. Maintaining or implementing the MLDA at 21 years rather than at a younger age is strongly recommended based on evidence from the United States, Canada, and Australia that the higher age requirement for legal drinking is effective in decreasing alcohol-related crashes and associated injuries among 18- to 20-year-old drivers. Other potential benefits include decreased alcohol consumption. No harms were reported and no qualifying economic information was identified from the literature.

**Sobriety checkpoints: strongly recommended.** Sobriety checkpoints are designed to systematically stop drivers to assess their level of alcohol impairment. The goal is to deter alcohol-impaired driving by increasing the perceived risk of arrest. There are two types of sobriety checkpoints. At random breath testing (RBT) check-

points, all drivers are stopped and tested for blood alcohol levels. RBT checkpoints are common in Australia and several European countries. In the United States, selective breath testing (SBT) checkpoints are used. At these checkpoints, police must have a reason to suspect that the driver has been drinking (i.e., probable cause) before testing blood alcohol levels. Sobriety checkpoints are strongly recommended based on their effectiveness in reducing alcohol-impaired driving, alcohol-related crashes, and associated fatal and nonfatal injuries in a variety of settings and among various populations. Corollary arrests are a potential added benefit. The brief intrusion this entails into drivers' privacy is generally considered justified by the public interest served by checkpoints. Four economic studies were identified, all of which indicated sizeable economic benefits.

**Intervention training programs for servers of alcoholic beverages: recommended,** when conducted as high-quality face-to-face training, accompanied by strong management support, there is insufficient evidence of the effectiveness of community-wide programs.

Server intervention training programs provide education and training to servers of alcoholic beverages with the goal of altering their serving practices to prevent patron intoxication and alcohol-impaired driving. These practices can include offering food with drinks, delaying service to rapid drinkers, refusing service to intoxicated patrons, and discouraging intoxicated patrons from driving.

Server intervention training programs are recommended on the basis of evidence that high-quality face-to-face training, when accompanied by strong management support, is effective in reducing the level of intoxication among patrons. The evidence on which this recommendation is based comes primarily from small-scale studies in which the participants may have been unusually motivated and the researchers had a high degree of control over the implementation of the server training. Although these findings are promising, they may not apply to larger, community-wide server training programs for which evidence is insufficient. No qualifying economic information was identified for either type of program.

## Interpreting and Using the Recommendations

Given that motor vehicle occupant injuries are the leading cause of injury death among people aged 1–34 in the United States,<sup>34</sup> reducing the number of motor vehicle crashes and crash-related occupant injuries should be relevant to most communities. States and communities can compare their current motor vehicle injury prevention interventions and activities with recommendations in this report. They can then take steps to ensure that existing interventions are adequately

implemented and funded, while considering implementation of other recommended interventions.

The Task Force recommendations can be used to support or expand child safety seat distribution programs, bolster the use of incentives, and employ enhanced enforcement campaigns, all in conjunction with community-wide education efforts. For example, the recommendation for child safety seat distribution and education programs might inform a community's decision to concentrate the distribution of low-cost or no-cost child safety seats in low-income neighborhoods, or to seek local sponsorship to defray the costs of seats distributed to needy families. In selecting and implementing interventions, communities should strive to develop a comprehensive program to reduce motor vehicle occupant injuries that adopts interventions from each of the three strategic areas and includes various intervention types, for example legislation, enforcement, public education, training, and other community-oriented strategies. If appropriately implemented, each of the approaches will contribute to reductions in occupant injury-related morbidity and mortality, and success in one area could contribute to improvements in the other areas as well.

The Task Force recommended or strongly recommended six state public health laws. Of those, three are already in effect in all 50 states (i.e., laws requiring use of child safety seats, lower legal BAC for young or inexperienced drivers, and an MLDA of 21 years). In addition, 49 states have laws requiring use of safety belts (New Hampshire has no such law). As of May 1, 2001, the other laws reviewed by the Task Force—0.08% BAC laws and primary enforcement safety belt laws—had been enacted in 24 states and 17 states, respectively, plus Washington, DC and Puerto Rico. In support of 0.08% BAC laws, the U.S. Congress included a provision in the 2001 Department of Transportation and Related Agencies Appropriations Act<sup>35</sup> requiring states to implement 0.08% BAC laws by fiscal year 2004 or risk losing federal highway construction funds.

The Task Force recommendations can be used to promote the adoption, maintenance, or strengthening of state or national laws or regulations. For example, at the state level, injury control program directors can use these recommendations to develop testimony about the effectiveness of different traffic safety laws for presentation to state legislatures. State legislators and their staff members can use the recommendations as they draft, debate, and vote on new or amended legislation. Advocacy and community groups, both local and national, can use the information to develop position statements about pending legislation. Health agencies can help educate the community about the importance and effectiveness of the laws and their enforcement. Health maintenance organizations can apply the findings from these reviews to the populations they care for, and can also use them to direct their involvement in the

broader community and to direct the involvement of their foundations.

Choosing interventions that work in general and that are well-matched to local needs and capabilities, then carefully implementing those interventions, are vital steps in improving use of child safety seats and safety belts and deterring alcohol-impaired driving. In setting priorities for the selection of interventions to meet local objectives, recommendations and other evidence provided in the *Community Guide* should be considered along with such local information as resource availability; administrative structures; and economic, social, and regulatory environments of organizations and practitioners. It is often useful to involve other partners in these efforts, such as each state's Governor's Office of Highway Safety, directors of state injury control programs in health departments ([www.stipda.org](http://www.stipda.org)), or local chapters of the National SAFE KIDS Campaign ([www.safekids.org](http://www.safekids.org)), the National Safety Council ([www.nsc.org](http://www.nsc.org)), and Mothers Against Drunk Driving ([www.madd.org](http://www.madd.org)). Additional information about applicability and economic information can be found in the accompanying articles.<sup>13-15</sup> Taking into consideration local goals and resources, the use of strongly recommended and recommended interventions should be given priority for implementation or enforcement.

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Recommendations to reduce injuries to motor vehicle occupants: increasing child safety seat use, increasing safety belt use, and reducing alcohol-impaired driving. Task Force on Community Preventive Services, American Journal of Preventive Medicine, Vol 21 No 4S, pp 16-22.**