

Analysis of Booster Seat and Seat Belt Use: How Many Wisconsin Childhood Deaths and Hospitalizations Could Have Been Prevented in 1998–2002?

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ABSTRACT

Background: Motor vehicle collisions (MVC) remain the leading cause of childhood death and injury in Wisconsin and throughout the nation. The objective of this study is to estimate the potential benefits of increased use of belt-positioning booster (BPB) seats for children ages 4-7, and increased seat belt use for children ages 8-18.5 years. The outcomes measured were the reduction in MVC-associated childhood deaths and hospitalizations as a result of increased use of BPB seats or seat belts.

Method: Childhood MVC-associated deaths and hospitalizations from 1998 to 2002 were obtained from the Wisconsin Interactive Statistics on Health (WISH) data query system. Three separate age groups were analyzed: children ages 4-7, 8-15, and 16-18.5 years. Ages for the groups were designed to match current "best practice" recommendations for the use of BPB seats, published age-range specific baseline restraint use data, and age specific mortality/injury relative risk (RR) values as closely as possible for a pediatric population. Population attributable risk (PAR) was calculated to predict preventable deaths and injuries (hospitalizations) over the years studied.

Results: From 1998 to 2002, MVCs accounted for 440 childhood deaths and 2639 injuries requiring hospital admission. Using the calculated PAR population statistic for each age group studied, the predicted reduction

in childhood MVC deaths and hospitalizations were calculated for various increases in restraint use above current baseline compliance. At the 100% use level, the model predicted 16 fewer deaths and 84 fewer hospitalizations for children 4-7 years old (BPB seat use); 45 fewer deaths and 206 fewer hospitalizations for children 8-15 years old (seat belt use); and 119 fewer deaths and 669 fewer hospitalizations for children 16-18.5 years old (seat belt use). The total potentially avoided deaths and hospitalizations across all age groups studied was 180 childhood deaths and 959 hospitalizations during this 5-year study period.

Conclusion: Communities should devote resources to public education programs directed at increasing the use of belt-positioning booster seats for children 4-7 years old and seat belts for older children. Evidence-based child passenger safety laws should be improved and enforced in Wisconsin in an effort to support families in their attempts to safeguard their children. With a multi-component child passenger restraint safety campaign, unnecessary MVC-associated childhood deaths and injuries can be avoided in the future.

INTRODUCTION

For Wisconsin children and children across the nation ages 1 year and older, motor vehicle collisions (MVC) are the leading cause of death and injury.¹ Although medical science has made many advancements in the treatment of illness and traumatic injury, the best intervention for childhood MVC injuries is primary prevention. Increasing the use of age-appropriate child passenger restraint devices such as infant/child car seats, belt-positioning booster (BPB) seats, and seat belts can decrease the number of childhood MVC-associated deaths and injuries. The purpose of this study is to estimate the potential impact that the increased use of BPB seats and seat belts would have had on child-

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hood MVC-associated deaths and hospitalizations during 1998–2002, the most recent 5-year period for which data are available. The study and awareness of avoidable deaths and injuries should lead to increased community health and safety, as well as state legislative efforts directed at increasing the use of BPB seats and seat belts by Wisconsin children.

METHODS

Mortality and Injury Data

Data were examined for 3 childhood age groups in this study: 4-7, 8-15, and 16–18.5 years old. The 4-7 year age group represents children most appropriately restrained by BPB seats.² The other groups were specified in an attempt to best match recently reported, age-range specific restraint use percentages for Wisconsin children and young adults: 0–4 years, 96% use; 5–15 years, 72% use; and 16–25 years, 60% use passenger, 65.9% use driver.³ For each age group, MVC mortality and hospitalization incident data (a proxy for non-fatal injury) were obtained from the Wisconsin Interactive Statistics on Health (WISH) data query system, “mortality” and “morbidity” modules,⁴ for the 5-year period 1998–2002. The following E codes for external cause of injury were used to query the morbidity module: E810-816; 4th-digit subdivisions .0 and .1.

Prevention Estimates

Population attributable risk (PAR) factors were calculated to estimate preventable deaths and hospitalizations over a range of increased percent usage, compared to current baseline BPB seat and seat belt compliance.⁵ Current prevalence of BPB seat use was estimated at 9%, based on a recent national sampling.⁶ Baseline seat belt compliance for children 8-15 years of age was 72%, and 60% for passengers 16-18.5 years old and 65.9% for drivers.³ The closest age-specific mortality and injury BPB seat and seat belt relative risk (RR) values were used to derive RR values for not using a BPB seat or not using a seat belt; the RR values were used to calculate PARs for the 3 age groups studied. The following RR age group matches were used: 2.53 mortality and hospitalization for children ages 4-7 years (BPB seat use);⁶ 3.85 mortality and 2.75 hospitalization for children ages 8-15 years (seat belt use);⁷ and 2.56 mortality and hospitalization for children ages 16-18.5 years (seat belt use).⁸ The RR value used for the 4-7 year age group calculations was derived from a BPB seat to seat belt comparison, therefore all children not using BPB seats defaulted to being in seat belts at the time of injury.⁶ Any bias resulting from this approach would lead

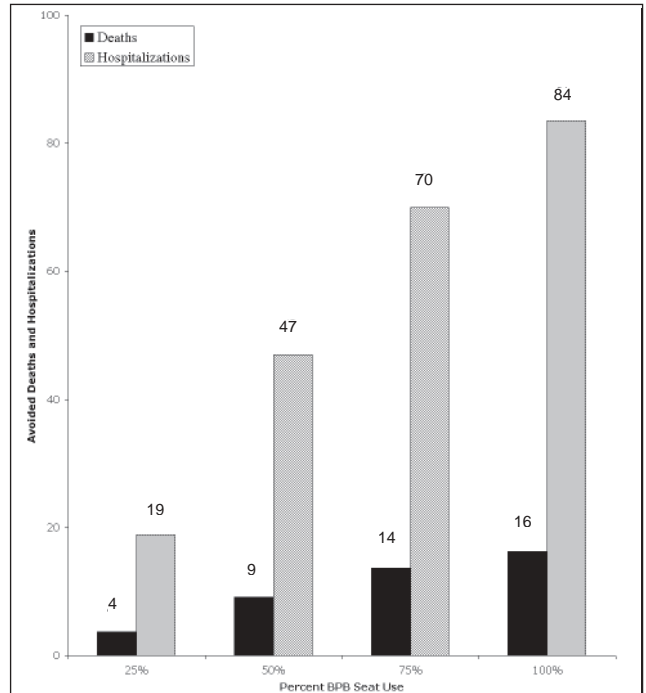


Figure 1. Avoided deaths and hospitalizations, children 4-7 years old, at various increase levels of belt positioning booster seat use, Wis, 1998-2002 (assumes 9%, BPB seat baseline use).

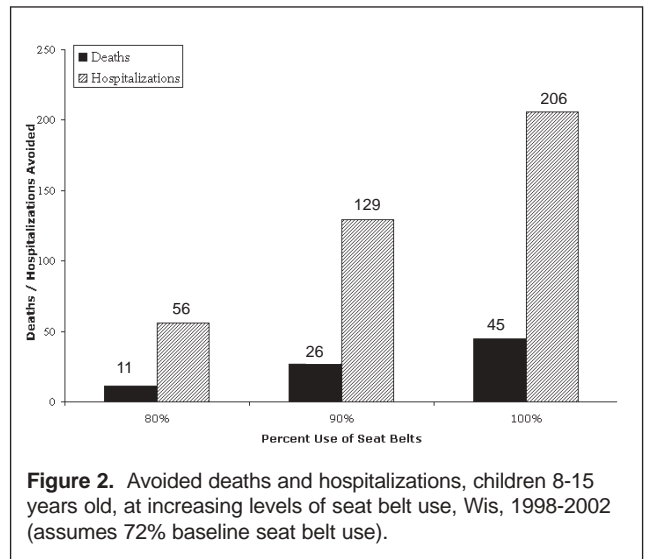


Figure 2. Avoided deaths and hospitalizations, children 8-15 years old, at increasing levels of seat belt use, Wis, 1998-2002 (assumes 72% baseline seat belt use).

to a more conservative estimate regarding the effect of booster seat use on death and injury.

RESULTS

During the study period, MVCs resulted in 28 deaths and 144 hospitalizations for children 4-7 years old, 101 deaths and 643 hospitalizations for children 8-15 years old, and 311 deaths and 1852 hospitalizations for children 16–18.5 years old. Age-group specific PAR values were used to calculate avoidable deaths and hospitaliza-

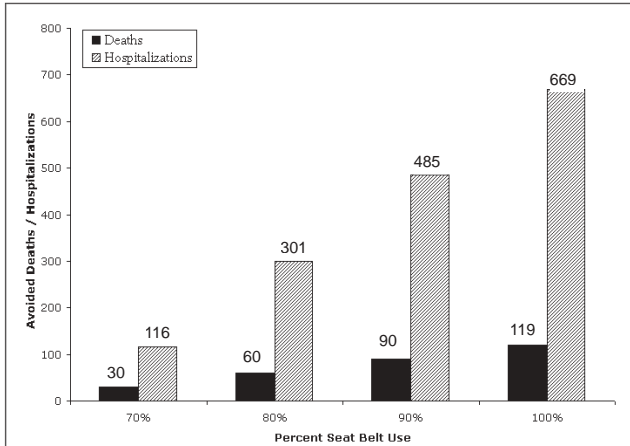


Figure 3. Avoided deaths and hospitalizations, children 16-18.5 years old, at increasing levels of seat belt use, Wis, 1998-2002 (assumes 60% baseline seat belt use passengers, 65.9% drivers).

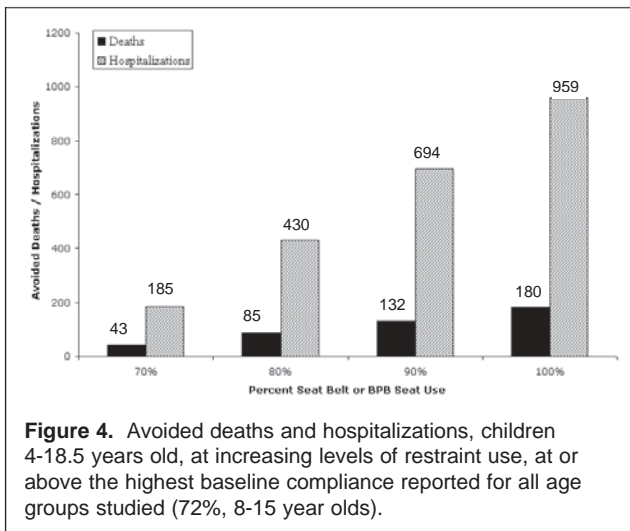


Figure 4. Avoided deaths and hospitalizations, children 4-18.5 years old, at increasing levels of restraint use, at or above the highest baseline compliance reported for all age groups studied (72%, 8-15 year olds).

tions over a range of increased restraint use above current baseline compliance. At 100% compliance in BPB seat use for children 4-7 years old, 16 deaths and 84 hospitalizations would have been avoided (Figure 1); for children 8-15 years old with 100% seat-belt use, 45 deaths and 206 hospitalizations would have been avoided (Figure 2); for children 16-18.5 years old, with 100% seat-belt use, 119 deaths and 669 hospitalizations would have been avoided (Figure 3). The aggregate potentially-avoided deaths and hospitalizations for all children, associated with increasing use of age-appropriate child passenger restraint, starting at the highest current compliance percentage for any of the 3 groups (72%, 8-15 years old) was also estimated (Figure 4). The model predicts an aggregate total reduction of 180 deaths and 959 hospitalizations if all children had been appropriately restrained.

DISCUSSION

These data support the call for greater public health-education measures to increase the use of age-appropriate child passenger restraint devices, specifically, BPB seats for children 4-7 years old and seat belts for older children. The Centers for Disease Control and Prevention (CDC)⁹ and the National Highway Traffic Safety Administration¹⁰ as well as multiple other child safety groups have advocated for the increased use of BPB seats; *Healthy People 2010: Health Objectives for the Nation* lists increased seat belt use as a goal for the nation's adolescent population.¹¹ The CDC task force on Community Preventive Services made the following evidence-based recommendations for increasing child passenger restraint use in a community: enact laws requiring restraint use, enhance enforcement campaigns, and establish community-wide information, education, and device distribution programs.¹² The multi-component intervention program suggested by the CDC is consistent with other health models proven to change health-related behavior in a positive manner.¹³

Regarding BPB seat use, parents indicate that laws consistent with medical "best practice" recommendations would be helpful when making child passenger restraint decisions, and would assist them in "selling" booster seat use to their children.¹⁴ Some parents have justified not using BPB seats because the law did not require such a device.¹⁴ As of April 2004, 26 states had passed some type of booster seat law; Wisconsin has no such legislation. Wisconsin's seat belt law is currently secondarily enforced for children older than 8 years old and adults; this includes teens operating a motor vehicle under the state's Graduated Driver Licensing program. Increases of 9% to 23% in seat belt use have been reported for states changing their secondary enforcement laws to primary enforced legislation.¹⁵

The results of this study illustrate the gains that could be made by increasing the use of BPB seats and seat belts by Wisconsin children. Although a health care cost analysis was not done as part of this study, the savings represented by the decrease in deaths and hospitalizations would be substantial. Community prevention programs that educate families about the importance of child passenger restraint use should be encouraged. Physicians can also take the opportunity to give these same messages to parents and teens at office visits. But while education is necessary, it is often not sufficient to attain behavioral change.¹⁶ Efforts should also be made to pass evidence-based legislation consistent with best practice recommendations here in Wisconsin. Such legislation would support families in their efforts to keep children safe while traveling in a motor vehicle.

CONCLUSION

The recommendations for legislative changes that would make Wisconsin's law consistent with best practice and with the medical and public-health evidence would be the following: (1) require all children 4-7 years old to ride in a belt-positioning booster seat and (2) have primary enforcement of seat belts through age 18. These legislative changes should be coupled with a statewide education and enforcement program. Such changes could result in an annual savings of more than 35 lives and approximately 200 hospitalizations in Wisconsin children 18 years and under.

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