Estimating Economic Benefits Due to Increased Seat Belt Use: A Case Study

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EXTENDED ABSTRACT

Even though the safety benefits of using seat belts are well-known among the transportation community, the average usage rates in some states remain at relatively low levels than it is desired. Among many factors that could be contributing the situation, the type of the seat belt law could be a major one. While many states still need to aggressively work on passing the primary seat belt law, estimating the benefits associated with increased seat belt use in terms of money might help in convincing the general public and the legislators. Accordingly, this study estimated the effectiveness of seat belts in reducing injuries and the associated economic benefits using state of Kansas data.

The estimation process included two stages. In the first stage, seat belt effectiveness in reducing injuries to motor vehicle occupants was estimated using crash data from the Kansas. These values were estimated using the logistic regression method separately for two vehicle groups: passenger cars and other passenger vehicles that included vans and trucks. In the second stage, the estimated seat belt effectiveness values were used to estimate potential injury reductions due to increased seat belt usage, which were then converted into dollar values by assigning economic costs to each type of injury severity.

According to the estimations, seat belts are 56% effective in preventing fatal injuries when used by passenger car front seat occupants. In the other passenger vehicle group that included vans and pickups, seat belts were found to be 61% effective in preventing fatalities. The seat belt effectiveness in reducing incapacitating and non-incapacitating injuries was found to be 53% and 55%, respectively, for passenger cars group and 52% and 51% for other passenger vehicle group. Based on the economic analysis, it was found that 1% incremental increase in current seat belt usage rate could annually save about $14 million to the state of Kansas. If seat belt usage in Kansas reaches the 2005 national average rate of 82%, the expected annual economic savings could be estimated to be around $222 million. Similar methodology could be used by any other state to estimate the expected economic benefits due to increased seat belt use.

Key words: benefits of seat belts—highway safety—logistic regression—seat belt effectiveness—seat belts
INTRODUCTION

The economic impacts due to highway crashes are enormous. Numerous efforts have been made to mitigate the vast impact of highway crashes. One of the remarkable implementations in this regard is the introduction of seat belts. It has been proven that seat belts are highly effective in improving passenger safety, saving many lives, and preventing many injuries to vehicle occupants. Due to high benefits already realized and potential future benefits that could be achieved through higher seat belt usage rates, many states have enacted seat belt laws to mandate the use of seat belts. As of 2005, 25 states plus the District of Columbia and Puerto Rico have primary adult seat belt laws, where police officers can stop and cite a motorist for the violation of the seat belt law. In the remaining states except New Hampshire, the law is secondary, where motorists can only be cited for violating the seat belt law after having been stopped for an unrelated traffic violation. The state of New Hampshire is the only U.S. state that does not mandate any seat belt law.

Despite the proven economical and health benefits derived from the seat belt usage, many U.S. states still observe low seat belt usage rates. According to the 2005 observational seat belt survey results, about 50% of the U.S. states still have seat belt usage rates that are less than the national average rate of 82%. In Kansas, where the law is secondary, the observed usage rate in 2005 was at 69%, which is significantly lower than the national average. Additionally, Kansas is among the 10 states with the lowest seat belt usage rates.

When considering benefits of seat belt use, it is unfortunate to note that more motorists are still not taking advantage of these benefits. Failure to use seat belts is costly, not only to the nonuser of the seat belt, but also to the whole society. Therefore, it is very important for transportation authorities to find ways that can increase the seat belt usage rate among motorists. Previous research efforts have indicated that the most effective way to increase the seat belt usage rate is through strong enforcement. In other words, seat belt usage rates can be increased by mandating the enforcement of a primary seat belt use law. According to National Highway Traffic and Safety Administration seat belt survey results, the change in law from secondary to primary has dramatically increased the observed seat belt usage rates in many states. However, such a decision should be well-supported by proven benefits at the local level. Although national estimations are available to quantify the benefits associated with seat belt use, it would be useful for the local authorities to have the estimated benefits (in dollar terms) derived from their local conditions in order to better promote the seat belt usage-related policies and campaigns.

OBJECTIVES

The main objective of this study was to estimate the effectiveness of seat belts in reducing injuries and to estimate associated economic benefits using state of Kansas data. This objective was achieved through two major stages. In the first stage, the motor vehicle crash data for the state of Kansas were used to estimate the effectiveness of seat belts in reducing fatal and nonfatal injuries. In the second stage, the expected economic benefits were estimated using the effectiveness values estimated in the first stage.

CALCULATION OF SEAT BELT EFFECTIVENESS

Highway crash data from Kansas Accident Reporting System (KARS) database were used to estimate the seat belt effectiveness. Data related to vehicles that were involved in crashes between 1993 and 2002 were extracted from the database. Only front-seat occupants of passenger cars, vans, and pickup trucks were considered in the analysis. Since the data availability for vans were limited, especially for fatalities, pickup trucks and vans were combined and considered as a single vehicle group. Thus, the estimations...
were based on two vehicle groups: passenger cars and other passenger vehicles. The seat belt effectiveness was then estimated using logistic regression modeling.

According to logistic regression estimations for the passenger cars group, seat belts are 56% effective in preventing fatalities to front-seat occupants in passenger cars. In other words, 56% of fatally injured front-seat occupants who were unrestrained at the time of the crash could have survived if all of them were restrained. As far as nonfatal injuries are concerned, seat belts are more effective in reducing non-incapacitating injuries (55%) compared to incapacitating injuries (53%). Additionally, seat belts are 33% effective in reducing possible injuries to passenger car front-seat occupants. For the other passenger vehicles group, seat belts are 61% effective in preventing fatal injuries to front-seat occupants. Seat belts are 52% effective in reducing incapacitating injuries and 51% effective in reducing non-incapacitating injuries in this vehicle group. The seat belt effectiveness for possible injuries in this vehicle group is 34%, which is slightly higher than the value obtained for the passenger cars group.

The procedure described by Blincoe was used to estimate the benefits associated with seat belt use. Some adjustments were made in the original procedure in order to accommodate for Kansas local conditions. The following steps were included in the process:

Step 1: Obtain injury frequencies
Step 2: Estimate average seat belt effectiveness
Step 3: Obtain seat belt usage rates
Step 4: Estimate expected safety improvements
Step 5: Obtain potential reduction in injuries
Step 6: Estimate economic savings

CONCLUSIONS

Based on the analysis conducted in this study, it was found that the first 1% incremental increase in current seat belt usage rate could annually save about $14 million to the state of Kansas. If seat belt usage in Kansas reaches the national average rate of 82% (2005 value), the resulted annual economic savings are estimated to be around $260 millions. In other words, due to the current low seat belt usage in Kansas as compared to the national average, the annual estimated economic loss is about $222 million. Moreover, about 37 additional lives could be saved if the current state seat belt usage rate of 69% is increased to the national average of 82%. It should be noted that the economic benefits estimated in this study only provide approximate values, and the real benefits may vary due mainly to the difficulty in estimating economic cost of motor vehicle crashes. Moreover, there may be some concerns about the accuracy of the data used in the analysis especially data related to seat belt usage and injury severities, which might have impacted the final estimated values. However, this type of dollar estimations would be useful to the local transportation officials to convince the general public about the benefits associated with increased seat belt use, which would in turn help win support for policy changes regarding seat belt use laws.