Bicycle safety helmet legislation and bicycle-related non-fatal injuries in California

Lee BH, Schofer JL, Koppelman FS. Accident Analysis & Prevention, 2005;37:93-102

Original paper External Link

Summary of paper (from authors’ abstract)

The objective of this study was to determine whether the bicycle safety helmet legislation in California, enacted in 1994, was associated with statistically significant reductions in head injuries among bicyclists aged 17 years and under who were subjected to the law. The study used 44,069 patient discharge cases from all public hospitals in California, from 1991 through 2000, and a case-control design to make direct comparisons between those subjected to the law (Youth) and those who were not (Adult) across the pre- and post-legislation periods. An aggregate data analysis approach and a pooled disaggregate data fitting technique using multinomial logit models were applied. The legislation was found to be associated with a reduction of 18.2% (99% confidence interval: 11.5–24.3%) in the proportion of traumatic brain injuries (Head-TBI) among Youth bicyclists. The proportions of other head, face, and neck injuries were not significantly changed across the pre- and post-legislation periods in this age group but there was a corresponding increase of 9% (5–13%) in the proportion of all other injuries. On the other hand, there was no statistically significant change in the proportions of injury outcomes for Adult bicyclists. The youngest riders, aged 0–9 years, had the greatest decrease in the proportion of Head-TBI. The reduction was the same for motor vehicle and non-motor-vehicle-related incidents. The bicycle safety helmet legislation was associated with a decrease in the likelihood of Head-TBI for non-urban residents but not for urbanites, for males but not for females, and for Whites, Asians, and Hispanics, but not Blacks and others.

BHRF Commentary

The authors chose to compare young riders and adults in order to investigate the effect of a youth-only helmet law. However, these are not compatible groups for a case-control study. Young riders have, on average, less skill and experience than older riders. They take more risks and they have a more frequent record of injury. The types of crash in which the two groups are involved differ, young riders being hurt more often off-road or through play activities whilst adults are more likely to be hurt as a result of collisions in traffic.

As the authors admit, no information about helmet use or cycle use is presented. Without helmet use data, it is not possible to draw any conclusions about helmet efficacy. Fewer head injuries post-legislation could as easily be attributable to less cycling or a change in the cycling profile as it could be due to increased helmet wearing. If the two groups of cyclists did not have similar wearing rates at the start of the study period, that too would add to the differences between the groups.

The lack of information about cycle use is not just with regard to risk exposure. There is also no information about the cycling profile or changes to it. Cycling profile describes cycling purpose (e.g. utility, leisure, spot, play) and location (on or off-road). Helmet laws in Australia proved to be a particular deterrent to cycling for utility journeys and by teenagers (e.g. BHRF, 1113). As the cycling profile changes, so does the injury profile. Whilst OR calculations may be unaffected by the amount of bicycling (exposure) between the two periods, they are certainly not independent of changes in cycling profile.

It is not possible to draw valid conclusions based on injury profile as an outcome measure without having good data on changes in cycling profile. Similarly, the authors’ assessment of the relative benefit of helmets by youth age group is no more than speculation without knowing the distance (or time) cycled by each group and how this changed over the study period.

Detailed examination on a per-annum basis of the data provided by the authors in their Table 1 reveals some
interesting facts not mentioned in the paper (see here for spreadsheet with expanded data):

- There was a fall of 14% in the per-annum casualties for youths, excluding Head-TBI (head traumatic brain injuries). This suggests a significant decrease in cycle use. If this is so, then reduced exposure and not helmet use accounts for half the decrease in Head-TBI injuries.
- The absolute number of Head-TBI injuries avoided is about 120 per annum (assuming the above decrease in exposure), in a state with 35 million people. There is no information as to how many of these injuries were life-threatening or with long-term consequences, but typically this is only a very small proportion.
- Post-law, there was a 29% fall in crashes involving youths and motor vehicles. On the other hand, adults were 18% more likely to crash with a motor vehicle. This suggests strongly a change in the cycling profile of youths, particularly relative to adults and highlighting once again the incompatibility of the two groups for a case-control study. Furthermore, if youths did ride less with traffic, that factor alone would make it much less likely that they would suffer serious head injury irrespective of helmet use.
- The rate of adult Head-TBI injuries increased over the period although helmet use by adults was also increasing.
- Adult crashes with motor vehicles increased, suggesting the possibility that helmet promotion associated with the law distracted attention from other means of addressing serious injuries through general road safety.

The impartiality of the researchers in carrying out the study is not clear. The extensive reference to previous studies supportive of helmet use, and with no reference to any study that has found otherwise, suggests that this project may not have been embarked upon with a completely open mind.

Conclusion

This study seeks to draw too many conclusions from too little data. Most of the paper is little more than speculation about what might have transpired as a result of the helmet law and the reasons for the inconsistent changes thus suggested. The model for a case-control study is inappropriate due to the many uncontrolled differences between the two age groups of cyclists. The lack of data on helmet use, cycle use and cycling profile makes it impossible to draw any meaningful conclusions.

References

BHFR, 1113

Helmet laws: Western Australia.
http://www.cyclehelmets.org/1113.html

The Bicycle Helmet Research Foundation (BHFR), an incorporated body with an international membership, exists to undertake, encourage and spread the scientific study of the use of bicycle helmets. Also to consider the effect of the promotion and use of helmets on the perception of cycling in terms of risk and the achievement of wider public health and societal goals.

BHFR strives to provide a resource of best-available factual information to assist the understanding of a complex subject, and one where some of the reasoning may conflict with received opinion. In particular BHFR seeks to provide access to a wider range of information than is commonly made available by those that take a strong helmet promotion stance. It is hoped that this will assist informed judgements about the pros and cons of cycle helmets.

For more information, please visit www.cyclehelmets.org.

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