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COMMUNITY GUIDE – SYSTEMATIC REVIEW

Universal Motorcycle Helmet Laws to Reduce Injuries: A Community Guide Systematic Review

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Context: Motorcycle crashes account for a disproportionate number of motor vehicle deaths and injuries in the U.S. Motorcycle helmet use can lead to an estimated 42% reduction in risk for fatal injuries and a 69% reduction in risk for head injuries. However, helmet use in the U.S. has been declining and was at 60% in 2013. The current review examines the effectiveness of motorcycle helmet laws in increasing helmet use and reducing motorcycle-related deaths and injuries.

Evidence acquisition: Databases relevant to health or transportation were searched from database inception to August 2012. Reference lists of reviews, reports, and gray literature were also searched. Analysis of the data was completed in 2014.

Evidence synthesis: A total of 60 U.S. studies qualified for inclusion in the review. Implementing universal helmet laws increased helmet use (median, 47 percentage points); reduced total deaths (median, –32%) and deaths per registered motorcycle (median, –29%); and reduced total injuries (median, –32%) and injuries per registered motorcycle (median, –24%). Repealing universal helmet laws decreased helmet use (median, –39 percentage points); increased total deaths (median, 42%) and deaths per registered motorcycle (median, 24%); and increased total injuries (median, 41%) and injuries per registered motorcycle (median, 8%).

Conclusions: Universal helmet laws are effective in increasing motorcycle helmet use and reducing deaths and injuries. These laws are effective for motorcyclists of all ages, including younger operators and passengers who would have already been covered by partial helmet laws. Repealing universal helmet laws decreased helmet use and increased deaths and injuries.

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CONTEXT

Motorcycle crashes contribute considerably to preventable fatal and non-fatal injuries in the U.S. Although motorcycles only account for about 3% of registered vehicles and 0.7% of traveled vehicle miles, a disproportionate 15% of all motor vehicle crash fatalities were due to motorcycle crashes in 2013.[1] The U.S. Government Accountability Office estimated that the total direct measurable costs from motorcycle-related crashes were approximately $16 billion in 2010.[2] A Cochrane systematic review found that motorcycle helmet use can lead to an estimated 42% reduction in risk for fatal injuries and a 69% reduction in risk for head injuries.[3] Helmet use in the U.S., however, remained around 60% in 2013.[4]

Motorcycle helmet laws require motorcycle riders to wear a helmet while riding on public roads. In the U.S., these laws

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are implemented at the state level with varying provisions and fall into two categories: universal helmet laws (UHLs), which apply to all motorcycle operators and passengers; and partial helmet laws (PHLs), which apply only to certain motorcycle operators such as those under a specified age (usually 18 years), novices (most often defined as having <1 year of experience), or those who do not meet the state's requirement for medical insurance coverage. Further, motorcycle passengers are not consistently covered under PHLs.

According to the National Occupant Protection Use Survey conducted by the National Center for Statistics and Analysis of the National Highway Traffic Safety Administration, helmet use is seen to be "significantly higher in states that require all motorcyclists to be helmeted," that is, states with UHLs.[5] The number of states implementing UHLs peaked in 1975, with 47 states requiring all motorcyclists to wear helmets. Since then, many states have repealed UHLs.[6] Currently, 19 states and the District of Columbia have UHLs.[6] Among the other states, 28 states have PHLs and three states (Illinois, Iowa, and New Hampshire) have no motorcycle helmet laws.[6]

The current review aims to evaluate the effectiveness of UHLs in increasing helmet use and decreasing fatal and non-fatal injuries. This review was a collaborative effort between researchers from the U.S. (Community Guide Branch and National Center for Injury Prevention and Control, both at the Centers for Disease Control and Prevention [CDC]) and Australia (The George Institute for Global Health at the University of Sydney). Researchers from the George Institute will prepare a companion review with a global focus, including evidence from low- and middle-income countries. This paper is based solely on evidence from the U.S.

The research questions for this review are:

How effective are motorcycle helmet laws in achieving the following outcomes?

- Increasing helmet use
- Reducing fatal and non-fatal injuries

Does helmet law effectiveness vary by the following factors?

- Universal helmet law versus partial helmet law
- Setting characteristics, such as rural versus urban
- Population characteristics, such as age, gender, race/ethnicity, or SES

EVIDENCE ACQUISITION

Detailed systematic review methods used for the Community Guide have been published previously.[7,8] For this review, a coordination team was formed, composed of motor vehicle injury prevention subject matter experts from various agencies, organizations, and academic institutions, together with systematic review methodologists from the Community Guide Branch at CDC. The team worked under the oversight of the independent, unpaid, nonfederal Community Preventive Services Task Force whose members are appointed to 5-year terms by the director of CDC.

Conceptual Approach and Analytic Framework

The analytic framework (Appendix Figure 1, available online) shows the postulated mechanism through which motorcycle helmet laws affect incidence and severity of non-fatal and fatal injuries. UHLs can lead to increased helmet use, resulting both in reduced incidence and severity of non-fatal injuries and in reduced fatal injuries. If motorcycle helmet laws affect overall motorcycle use, as some have speculated,[9] that could also contribute to observed decreases in fatal and non-fatal injuries. Other factors that may influence helmet use or injury include strength of the law (UHLs versus PHLs); intensity of enforcement efforts; type of helmet used (U.S. Department of Transportation approved or non-approved); and individual attitudes such as the desire not to wear a helmet.

Search for Evidence

Reviewers from the George Institute in Sydney, Australia, conducted the search for evidence, and the detailed search strategy can be found at: www.thecommunityguide.org/mvoi/motorcyclehelmets/supportingmaterials/SShelmetlaws.html. Briefly, databases relevant to health or transportation were searched from database inception to August 2012. Reference lists of reviews and reports relevant to the current review were also searched. Two reviewers from the George Institute performed the initial screening and eliminated publications not evaluating motorcycle helmet laws. Reviewers from CDC's Community Guide Branch further screened the publications using the predetermined inclusion criteria listed below.

Inclusion Criteria

Studies were included in the current review if they evaluated motorcycle helmet laws and also met the following criteria:

- published in English;
- published journal article or government report; and
- reported at least one outcome of interest.

Assessing and Summarizing the Body of Evidence on Effectiveness

Study abstraction. Each study meeting the inclusion criteria was independently abstracted by two reviewers. Reviewers from the George Institute developed abstraction forms by adapting guidelines from the Cochrane Effective Practice and Organization of Care group.[10] Information on intervention components, population demographics, and outcomes was gathered using these forms. Uncertainties and disagreements were reconciled by consensus among review team members.

Risk of bias assessment. The team evaluated each study's risk of bias using templates adapted from the Cochrane Effective Practice and Organization of Care group[10]: Were data analyzed properly? Was the intervention independent of other changes? Were sufficient data points used for reliable statistical inference? Was the intervention unlikely to affect data collection? Was