



COMMENTARY

Changes in traffic crash mortality rates attributed to use of alcohol, or lack of a seat belt, air bag, motorcycle helmet or bicycle helmet, United States, 1982 - 2001

Cummings P, Rivara FP, Olson CM, Smith KM *Injury Prevention*, 2006; 12:148-154

[Original paper](#) **External Link**

As indicated by its title, this paper is concerned with mortality rates attributed to a number of causes.
This commentary, however, is concerned only with those parts of the paper that refer to bicycle helmets.

Summary of paper (based on authors' abstract)

An aim of the study was to estimate how the wearing of bicycle helmets has influenced US traffic crash mortality. Attributable deaths were estimated using data from a single earlier study and not from new research carried out for this study. The main outcome measures were: counts of deaths attributable to not wearing a helmet; changes in rates of deaths; and counts of lives saved in risk factor prevalence. There were 858,741 traffic deaths during the 20 year period. Estimated deaths attributed to not wearing a bicycle helmet were 10,552 (1.2% of all deaths). Over the 20 years, mortality rates attributed to this risk factor declined by 39%. 239 lives were saved by the use of bicycle helmets.

BHRF Commentary

No basis for risk reduction ratio

The authors assume that wearing a cycle helmet reduces the risk of a fatality by 65%. This ratio is taken directly from a study (Thompson, Rivara and Thompson, 1996) which did not include a single fatality, being concerned predominantly with minor wounds to the head. The study has been widely criticised for methodological shortcomings (Thompson, Rivara and Thompson, 1996) and its conclusions have never been confirmed by real-world data.

It is not credible to predict the benefit of helmets in preventing fatalities from an unreliable estimate of their ability to prevent minor injuries.

On the other hand, more robust data based on whole populations and localised research specifically targeted at cyclist fatalities has failed to show any significant benefit from cycle helmets in preventing deaths (BHRF, 1012). NEISS data shows that from 1991 to 2005 only 45% of cyclist fatalities were due to head injury so a benefit of helmets greater than that is not possible (BHRF, 1177). There are also inherent limitations in the ability of lightweight polystyrene helmets to withstand the considerable forces present in crashes that lead to fatalities. Despite the considerable effort that has been put into research about cycle helmets, there is no strong real-world evidence that helmets have ever resulted in the net saving of even a single life.

Inaccuracy of FARS data

The estimates in this paper for the effectiveness of bicycle helmets are highly dependent upon the paper's assumption that the data on bicycle helmet use among fatally injured bicyclists contained within the Fatality Analysis Reporting System (FARS) database is at least as valid as that for motorcycle helmet use and seat belt use.



However, this is not the case. FARS was underestimating actual helmet use among fatally injured bicyclists by up to an order of magnitude or more during the period 1994- 98. Although the situation has improved considerably since then, FARS continues to underestimate overall bicycle helmet use in the US by a factor of two or more as of 2004 (the most recent data available) (BHRF, 1174).

The overall 2% bicycle helmet use figure FARS indicated in 1994 (and as recently as 1998) has no basis in reality, and the assumption by the authors that helmet use among fatally injured bicyclists was essentially nil before 1994 is fundamentally flawed.

About 30% of all US bicycle fatalities occur in California and Florida. These states have relatively good bicycle helmet use data, going back at least a decade. California bicycle helmet use data from the StateWide Integrated Traffic Records System (SWITRS) (Cal Highway Patrol) extends back fairly reliably to 1990 and it is noteworthy that even in the earlier 1990-93 period, helmet use had already reached at least 8.4% among fatally injured CA bicyclists, and that perhaps a dozen other states may have had helmet use rates equal to or greater than that (based on the current relationship between other states' FARS data and SWITRS). (BHRF, 1174)

During this earlier period, SWITRS data indicates that helmet use among non-fatally injured CA bicyclists grew steadily from at least 6.3% in 1990 to 9.0% in 1993, before jumping to at least 13.5% in 1994 and at least 16.7% in 1995 (mostly in response to the passage of a mandatory helmet law in 1994 covering all CA bicyclists under the age of 18), and eventually reached a plateau level of at least 20-22% from 1999 on. Note that since SWITRS counts non-use and unknown use cases under the same category, all CA data on helmet use are actually minimum estimates, which could be substantially higher depending on the actual ratio between non-use and unknown use. Since the overall helmet use rate averaged just greater than 7.5% among non-fatally injured CA bicyclists during 1990-93, it could be argued that bicycle helmets had no net beneficial effect at all in preventing fatalities, though later data suggests this more likely was just an artifact of non-fatal helmet use being less reliably recorded during the earlier period.

Over the next 10 years (1994-2003), non-fatal helmet use averaged at least 18.76%, compared to at least 15.52% among fatally injured CA bicyclists, which suggests that bicycle helmets have only been about 17% effective in preventing fatalities statewide, though this could be an underestimate if (as seems likely) the relative ratio of unknown use to non-use is lower for fatally injured cyclists compared to non-fatally injured cyclists. However, selective recruitment effects have almost certainly resulted in a positive bias of the estimate of overall effectiveness, so it remains quite possible there is no net safety benefit associated with bicycle helmets at the whole population level. Since any plausible result is still far lower than the 65% effectiveness the authors have assumed for bicycle helmets based on a single case control study (Thompson, Rivara and Thompson, 1996), it seems that either the assumed effectiveness of bicycle helmets has been greatly inflated relative to real world data, and/or risk compensation effects have essentially negated most or even all of the net safety benefits bicycle helmets may have to offer in the event of a crash (by apparently 'encouraging' helmeted cyclists to crash more often and/or get into more serious crashes).

A decline in cycle use

The paper does not consider the consequences of fewer people cycling, which in itself might be expected to result in fewer fatalities though with greater risk per individual cyclist due to the inverse of the 'safety in numbers' hypothesis. Instead, in predicting the benefit of helmets, the authors have applied their risk reduction ratio to the fall in cyclist fatalities in its entirety.

Peer responses

A detailed criticism of the authors' use of FARS data and the implications for assessing helmet effectiveness has been published on the Injury Prevention website (Geary, 2006).

References

BHRF, 1012



[What evidence is there that cycle helmets save lives?..](http://www.cyclehelmets.org/1012.html)

<http://www.cyclehelmets.org/1012.html>

BHRF, 1174

[FARS bicycle helmet use data..](http://www.cyclehelmets.org/1174.html)

<http://www.cyclehelmets.org/1174.html>

BHRF, 1177

[NEISS data on bicyclist injuries..](http://www.cyclehelmets.org/1177.html)

<http://www.cyclehelmets.org/1177.html>

Cal Highway Patrol

[State Wide Integrated Traffic Records System.](http://www.chp.ca.gov/switrs/) California Highway Patrol. **External Link**

<http://www.chp.ca.gov/switrs/>

Geary, 2006

Geary RR, 2006. [Faulty FARS bicycle helmet use data & implications for effectiveness.](http://www.cyclehelmets.org/1177.html) Injury Prevention Online letters, 29 June 2006. **External Link**

<http://ip.bmjournals.com/cgi/eletters/12/3/148>

Thompson, Rivara and Thompson, 1996

Thompson DC, Rivara FP, Thompson RS., 1996. [Effectiveness of bicycle safety helmets in preventing head injuries: a case-control study.](http://www.cyclehelmets.org/1159.html) JAMA 1996 Dec 25;276(24):1968-73. **Link includes commentary.**

<http://www.cyclehelmets.org/1159.html>

The Bicycle Helmet Research Foundation (BHRF), 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.

BHRF 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 BHRF 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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