The risk compensation theory and bicycle helmets

EDITOR,—It has come to our attention that a number of readers have been mystified by our contribution to the debate about bicycle helmets published in the June issue (2001;7:86–91). In particular, those familiar with our previous writings on the subject were puzzled by the claim of the Thompsons and Rivara, in what appeared to be the conclusion, that we agreed with them that “bicycle helmets are effective in decreasing head injuries to cyclists”. The confusion was caused by the fact that the responses were published in the wrong order. For those wishing to clear up the mystery, we recommend returning to the published debate and reordering the contributions as follows:

1. Risk compensation theory should be subject to systematic reviews of the scientific evidence (Thompson, Thompson, and Rivara).
2. The risk compensation theory and bicycle helmets (Adams and Hillman).
3. Response from Thompson, Thompson, and Rivara.
4. Response from Adams and Hillman.

It will then be clear that “We did not accept that bicycle helmets are effective in reducing head injuries” and, of crucial importance to the debate, why. We regret that the editor has nor seen fit to clear matters up properly by republishing the responses in their logical sequence.

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Safety in numbers? A new dimension to the bicycle helmet controversy

EDITOR,—The recent exchange about risk compensation and bicycle helmets overlooked an important dimension of the issue.1,2 By reducing cycling and, hence, diluting the effect of “safety in numbers”, compulsory helmet laws could have the perverse effect of increasing serious injury rates among those who continue to cycle.

Nearlly all fatal cycling crashes involve motorists. But there is evidence that the rate of bicycle-motor vehicle crashes declines as the amount of cycling on a road or in a region increases. This “safety in numbers” effect is thought to occur because as cyclists grow more numerous and come to be an expected part of the road environment, motorists become more mindful of their presence and more respectful of their rights.

The implication is that adding cyclists to the road makes it less likely that a motorist will strike an individual cyclist and cause serious injury; and, conversely, removing cyclists from the traffic stream raises the risk to those who continue to cycle. One empirical estimation of this effect, preliminary and site-specific, pointed in an explicitly downward a cyclist safety-volume “power law” of approximately 0.6.3

According to this relationship, the probability that a motorist will strike an individual cyclist on a particular road increases with the 0.6 power of the number of cyclists on that road. Say the number of cyclists doubles. Then, since twice raised to the 0.6 power is 1.52, each cyclist would be able to ride an additional 50% without increasing her probability of being struck. (The same phenomenon can be expressed as a 34% reduction in per cyclist crash risk per doubling in cycling volume, since the reciprocal of 1.52 is 0.66.) A confident estimate of the precise value of this safety-volume relationship will require further study, but two other studies report similar relationships, one for cyclists and the other for pedestrians.4 This suggests an important thought experiment regarding compulsory helmet legislation:

Suppose that (i) cyclists currently are split between helmet wearers (one third) and bareheaded cyclists (two thirds), (ii) there is no self selection or other confounding difference between bareheaded and helmeted cyclists as regards their risk of injury-causing accident; (iii) a helmet law provokes one third of the bareheaded cyclists to quit cycling, or slightly less attention than occurred in Australia when cycling helmets were made compulsory;4 (iv) all cycling fatalities are motor vehicle related (as is nearly the case); (v) risk compensation does not occur, that is, helmeted cyclists do not ride more adventurously than bareheaded ones; and (vi) helmets are 10% effective in preventing fatalities in the event of crashes, reflecting the modest reduction in severe injury rates found by Rivara et al for 3390 cyclist injuries reported from seven Seattle area hospital emergency departments and two county medical examiners’ offices.5

With these assumptions and the foregoing safety-volume power law, it is easy to show that a compulsory helmet law, far from reducing the rate of cycling fatalities, would increase it by 8%. The culprit is the hypothesized 22% decline in cycling volume, which engenders a 16% increase in per cyclist crash risk for all cyclists (since 0.78 raised to the 0.6 power equals 0.86, the reciprocal of which is 1.16). This more than offsets the assumed 10% reduction in fatalities per crash among previously bareheaded cyclists.

To be sure, the model is simple, and the assumptions are at best first approximations. If the “safety in numbers” power law constant is in fact 0.6, then a helmet effectiveness rate over 20% in preventing fatalities (not just injuries) implies that compulsory helmet laws will reduce fatality rates for those who continue to cycle, as claimed. Of course, those who quit cycling will no longer reap the manifold and extensively documented health benefits.

This thought experiment indicates the need to add another dimension, that of “safety in numbers”, to the ongoing debate over helmet promotion and policy. It also makes clear the need for further research to measure the precise value of the safety in numbers effect. It may very well prove to be the case that more cycling is better for reducing cyclist casualties than more helmets.

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References
1 Thompson DC, Thompson RS, Rivara FP. Risk compensation theory should be subject to systematic reviews of the scientific evidence. Inj Prev 2001;7:86–8.

CALENDAR

1st Asian Regional Safe Community Conference
25–27 February 2002, Suwon, South Korea. Further information: Ms Hyun Jong Song, Department of Emergency Medicine, Ajou University School of Medicine, Wonchon-dong 3, Paldal-gu Suwon 442–721, South Korea (tel: +82 31 219 4586, email: ajemc@madang.ajou.ac.kr, website: www.safesuwon.or.kr).

5th International Conference on Fatigue in Transportation. Coping with the 24 hour society
11–15 March 2002, Fremantle, WA, Australia. The conference is on non-prescriptive approaches to managing fatigue in transportation. Further information and abstracts (by 1 February 2002): Laurence Hartley, Conference Convenor, Institute for Research in Safety & Transport, Psychology, Murdoch University, Western Australia 6150 (fax: +61 8 9360 6492, hartley@soecs.murdoch.edu.au).

4th Fourth International Symposium on Safety in Ice Hockey
5–6 May 2002, Pittsburgh, PA, USA. The objective of the symposium is to review the current state of the art and science of prevention of ice hockey injuries. One session will be devoted to in-line or roller hockey injuries. The meeting will cover new and old protective equipment, coaching techniques to decrease the risk for injuries, playing rule changes to decrease the risk for injuries, and awareness programs for players, parents, coaches, referees, and administrators. Further information: Symposium Co-Chairmen: Alan B Ashare, St Elizabeth’s Medical Center, Boston, MA, USA (tel: +1 617 667 0000, aashare@semc.org) and David J Pearsall,
Thanks to reviewers

Journals cannot function properly without the generous help of reviewers. In the past year we have called on a record number of experts to guide us in making the right decisions. Being listed in this manner is insufficient thanks for the time and effort involved but it is the best we can do. In addition to those listed, every member of the editorial board has reviewed several papers for the journal in the past year. To all of you go my sincere thanks—and, I trust, those of the authors whose papers you reviewed.

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