COMMENTARY

Why it is wrong to claim that cycle helmets prevent 85% of head injuries and 88% of brain injuries

All other studies show smaller or no benefit

Claims that helmets prevent 85% of head and 88% of brain injuries are widely quoted by advocates of helmet laws. Despite many later studies showing lesser benefits, the 85% and 88% reductions continue to be cited.

The 85% and 88% estimates are from a small study in 1987 in Seattle (Thompson, Rivara and Thompson, 1989). The difficulties of interpreting data from this (and other case-control studies) are explained, to shed light on why their estimates are so different to real-life experience of helmet laws, all of which show no noticeable benefit of forcing millions of cyclists to wear helmets (BHRF, 1096; Robinson, 1996).

Government agencies withdraw support for 85% claim

In June 2013, US federal agencies The National Highway Traffic Safety Administration (NHTSA) and the Centers for Disease Control (CDC) decided that they could no longer justify citing the claim that bicycle helmets reduce the risk of head injury by 85%. The agencies had been challenged under the Data Quality Act to show why they ignored later research, none of which had produced such convincing results. Other US Government agencies are expected to follow suit. (GGW, 2013)

Problems with the Seattle Study

Data for children under 15 (the most significant comparison in the Seattle study) are used to illustrate the problem. In Seattle in 1987, observational surveys counted 4501 child cyclists; 3.2% wore helmets (DiGuiseppi, Rivara, Koepsell and Polissar, 1989). Hospital data showed 143 children (the 'cases') had emergency room (ER) treatment for head injury (HI) and 202 had ER treatment for other injuries (the ER controls). 2.1% of HI children and 5.9% of ER controls were wearing helmets.

Nothing can be concluded from the above data. So few children wore helmets that the differences in helmet wearing (HW) for HI and ER controls are no more than expected from random variation; neither is significantly different to HW in the observational surveys. Put simply, about 3% of child riders in Seattle wore helmets, as did roughly 3% of HI children, so from children's hospital data we cannot conclude that helmets offer any protection at all.

However, the Seattle study also considered a second group of cyclists, members of a Group Health Cooperative (GHC) who had fallen off their bikes. 86% of these cyclists were children under 15, so comparisons between this and the other groups are dominated by data for children. GHC children were from households with higher average income and educational levels and 21.1% were wearing helmets when they fell off their bikes.

If we assume the GHC group is typical of children who had bike accidents in Seattle, it would appear that helmets are of benefit. If 21.1% of children in bike accidents wore helmets, but only 2.1% of those with HI, helmets must have prevented HI in the remaining (21.1% - 2.1%) = 19% of children, i.e. helmets prevent 19/21.1 = 90% of head injuries.

This assumption (from the Seattle study) leads to other conclusions. If 21.1% of children in bike accidents wore helmets, but only 3.2% of child cyclists riding round Seattle (DiGuiseppi, Rivara, Koepsell and Polissar, 1989), helmet wearers must be (21.1/3.2) = 6.6 times more likely to have accidents. Thus wearers may be protected if they have accidents, but because they are nearly 7 times as likely to have accidents, their overall risk of HI is similar to non-wearers, but their risk of non-head injury is much higher!

This is bad news for helmet wearers because 57% of HI in the Seattle study were wounds to the scalp, forehead or ears, presumably no more serious than wounds to other parts of the body. Who would want to have 7 times as many accidents in exchange for protection from these often minor injuries?

Before accepting the above conclusions, we must examine the assumptions on which they were based - that HW in the GHC group was typical of child cyclists in accidents in Seattle. This seems unlikely. GHC families had above average income, so it would be easier to afford to buy helmets. We may also speculate that this particular healthcare group was interested in bicycle helmets and successfully promoted them to members. Finally, why was HW (21.1%) in the GHC group so different to the 5.9% of ER controls? If 21.1% of cyclists in accidents wore helmets, as well as preventing 90% of HI, we'd have to conclude helmets prevent 72% of non-head injuries! Alternative explanations, e.g. the promotion of helmets to GHC members, or that cyclists who chose to wear helmets are more safety conscious or have less severe accidents, seem more likely.

Safety conscious cyclists more likely to wear helmets

The fact that, in general, safety conscious cyclists chose to wear helmets represents a major problem for case-control studies of the efficacy of helmets. A study in Tucson, Arizona, found than helmet users had less severe non-head injuries: "This implies that nonusers of helmets tend to be in higher impact crashes than helmet users. … It is possible that at least some of the 'protection' afforded helmet wearers in previous studies may be explained by safer riding habits rather than solely a direct effect of the helmets themselves" (Spaite et al, 1991). In Seattle, helmet wearers were more likely to be white than other races, had geared rather than nongeared bikes, rode in playgrounds, parks or on bicycle paths rather than city streets and rode with adults rather than alone (DiGuiseppi, Rivara, Koepsell and Polissar, 1989). As suggested by the Tucson study (Spaite et al, 1991), it is plausible that these differences (which might lead to less severe accidents and hence less HI), rather than helmets, were responsible for the differences in HI rates of wearers and non-wearers. Most case-control studies attempt to adjust for such differences, but it is virtually impossible to record and adjust for every difference likely to affect the risk of HI.

Head injury data following helmet laws is more informative

For this reason, time series from countries where helmet wearing increased dramatically because of helmet laws provide the most useful information about helmet wearing (Robinson, 1996). In every case, the large increases in helmet wearing resulted in no noticeable decreases in the percentages of injured cyclists with HI. Perhaps cyclists forced to wear helmets ride more dangerously, and so increase their risk of HI, perhaps helmets are worn incorrectly, or perhaps the benefits of helmets are too small to be detected.

Either way, it is incorrect to claim that helmets prevent 85% of head and 88% of brain injuries. If this were really true, the effect on %HI would have been noticeable when millions of cyclists were forced by law to wear helmets.

References

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