

Cycle Helmet Performance in the Real World

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Introduction

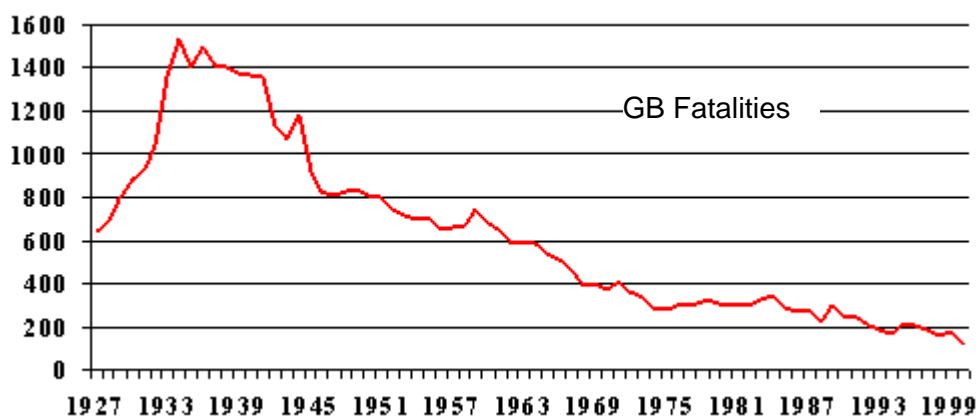
Cycle helmets have been around for a quarter of a century. At first they were promoted mainly by their manufacturers, with claims and counter-claims as to the benefits of their products. Then, during the 1980s, reports began to be published suggesting that if cyclists wore helmets they would be less likely to suffer head injury. From that time, the promotion of helmet wearing by cyclists has been a main thrust of road safety practitioners.

Dozens of research papers have been published. Many have predicted large savings in life and injury. The most influential report, by Thompson, Rivara & Thompson, predicted a reduction of 85% in head injury and of 88% in brain injury.

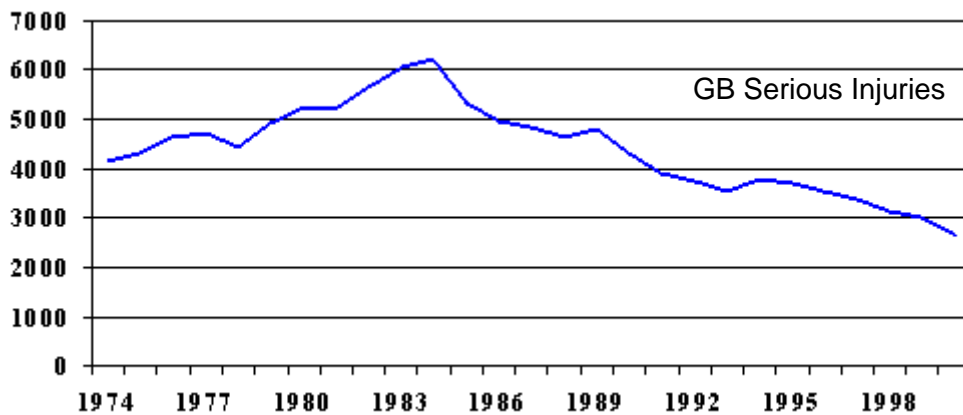
Of course, what really matters is not the predictions that are made, but real-world performance, over a reasonable period of time. It is now possible to look at traffic crash statistics from a number of countries to see the actual effect that cycle helmets have had on cyclist casualties, particularly those involving death or serious injury.

Great Britain

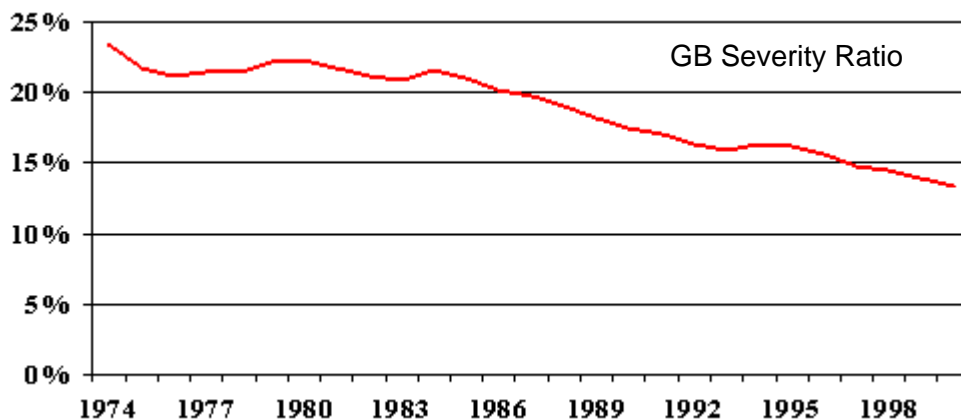
In Great Britain, cyclist fatalities have been falling almost continually since 1934, when there were 1,536 cyclist deaths. By 2000 this had fallen to 127.



From 1974, the number of serious injuries rose until 1984 and has fallen steadily since. The number of minor injuries also rose until 1984 and has remained steady since that time at around 20,000 per year.



These statistics take no account of the number of people cycling, which has fallen dramatically since the trend of declining fatalities started in 1934. Looking at casualties in isolation from cycle use is meaningless, and a fairer way to assess trends is to consider the severity ratio, or the proportion of cyclist casualties that involve fatal or serious injury.



Since 1974 the severity ratio has fallen almost consistently, although it is interesting that the fall was arrested between 1993 and 1996, a phenomenon that applied only to cyclists and not other road users for whom crashes continued to become less serious.

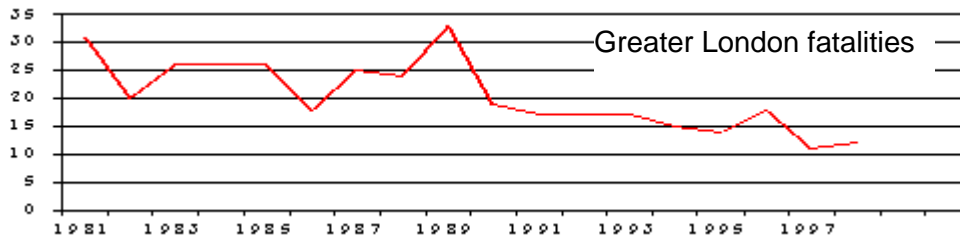
Until the mid 1980s helmet use was rare amongst British cyclists. Helmets started to be seen from about 1986, but take-up was slow for some years. By 1996, however, around 1 in 6 British cyclists wore helmets.

This rise in helmet use over a decade is significant, and might be expected to result in a detectable impact on recorded casualties to cyclists. However, for Great Britain as a whole, the trends in fatalities, serious injuries and severity ratio show no evidence at all of a beneficial 'helmet effect'. Indeed, what change there has been in severity ratio would suggest that the proportion of serious injuries actually increased during the period of greatest helmet take-up.

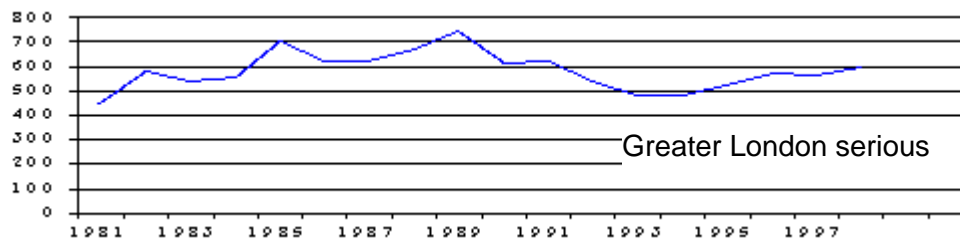
London

Greater London has the largest incidence of helmet use by cyclists in Britain. Over the decade to 1996, the wearing rate rose from close to zero to over 40%.

The number of cyclist fatalities in London has fallen in most years since 1981, the continuation, as for Britain as a whole, of a very long-standing trend.

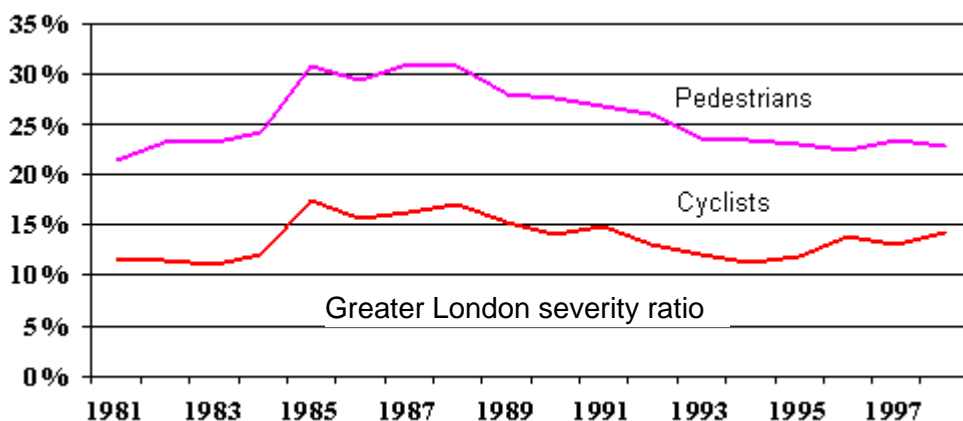


Serious injuries, on the other hand, show no clear trend but have increased in total number since 1994.



Again, it is fairest to examine the severity ratio to take account of cycle use. For cyclists, there has been no improvement on the severity ratio of the early 1980s and, indeed, the seriousness of crashes has increased since 1994.

The trends in fatalities, serious and slight injuries and severity ratio for Greater London show no evidence of influence due to the increased wearing of cycle helmets. Indeed, serious injuries, both in total and by ratio, increased noticeably as helmet use became more common.



It may be, of course, that some mitigating factor is cancelling out benefits achieved through helmet use, so it is useful to compare the severity ratio for Greater London of cyclist and pedestrian road casualties. Pedestrian trends have been very similar to those for cyclists for very many years. However, since 1985 the average seriousness of pedestrian casualties has decreased more than that for cyclists, and the severity ratio has not increased since 1994. Clearly, pedestrian trends have not been influenced by the wearing of helmets.

In Britain, other cities show similar trends. For example, in Cambridge, which is the city with the greatest amount of cycling, 1 in 3 cyclists wore helmets in 1998 but it is not possible to discern any improvement in casualties or severity ratio that might be attributable to such a large increase in helmet use.

Other countries

Large population studies from other countries also do not seem to provide evidence of real-world benefit from cycle helmets.

In Australia, mandatory helmet laws provided a whole-population sample with which to assess the effectiveness of a large increase in helmet use. Early official studies claimed a success as head injuries declined significantly, but the studies failed to take account of the large decrease in cycling brought about by the laws or the concurrent trends in declining head injury across all road users.

More recent official research suggests that head injuries may only have fallen by 11%, which is less than the decrease in cycle use. The risk of head injury amongst those who continue to cycle has risen, and in some parts of Australia injury rates are now at an all-time high.

In New Zealand, large increases in helmet use seem not to have brought about any reduction in the proportion of serious head injuries, whilst legislation caused cycle use to fall. Some reduction in mild concussions and lacerations was balanced by an increase in neck injuries.

In Canada cycle helmet use had risen to 50% by 1997, but analysis has shown there to have been no detectable impact on cyclist fatalities.

In the USA as long ago as 1988, Rodgers studied over 8 million cases of injury and death to cyclists over 15 years – by far the largest sample analysis of cycling casualties ever undertaken. He concluded that there was no evidence that helmets had reduced head injury or fatality rates. Indeed, he suggested that helmeted riders were more likely to be killed.

Later Kunich analysed cyclist and pedestrian fatalities over a period when cycle helmet use rose from close to zero to 30 per cent or more. Although cyclist deaths fell during this period, the decline was proportionately less than for pedestrians and the continuation of a long-term trend probably associated with exposure.

Last year, the Consumer Product Safety Commission, a US Government agency, reported that helmet use in the USA had risen from 18% to 50% in the decade 1991 to 2001. During the same period cycle use had gone down by 21%. Yet head injuries in total number had increased by 10%. Cyclists are now 51% more likely to suffer a head injury than a decade ago.

In March this year the Canadian Medical Association published a review of a cycle helmet law in Nova Scotia. The headline conclusions of the researchers were that in 3 years cycle helmet use had more than doubled from 36% to 86% and the proportion of head injuries to cyclists had halved.

The CMA seems to have had its concerns about the research, because in the same edition of their journal there was another article from a senior health professor pointing out that the research had also found that cycle use over the period had declined by 40% to 60%, with the biggest decrease amongst teenagers. This, it was acknowledged, had serious implications for the trends of increasing obesity and low levels of physical activity amongst young people which are causing such concern..

The reduction in head injuries had, at best, only fallen in line with cycle use. In particular, there was no evidence that those who continue to cycle but now wear a helmet are any less at risk from serious head injury. Most worryingly, however, the total number of injuries (not just to the head) to cyclists over the 3 years had increased by 6%. Taking account of the average 50% decrease in cycle use, this means that those who continue to cycle are now 87% more likely to suffer injury than before helmet legislation.

Why the shortfall?

There is, then, across many countries a consistent disparity between the optimistic predictions of widely-publicised clinical research and the real-world testimony of traffic casualty statistics. If helmets are effective in reducing head injury, it seems reasonable to expect that the reductions in injuries would be reflected in the general casualty statistics, particularly in places where helmet use has become significant. With up to a half of cyclists wearing helmets in some cities, it is difficult to see what greater use would be necessary to achieve casualty reductions that are discernible.

Why should this be?

First, the quality of helmet research is often very poor, typically being based on small samples with poor control populations. A paper in the *British Medical Journal* two years ago noted that head injury admissions to hospitals had declined during a period when helmet use had risen, and concluded that there must therefore be an exclusive association between the two! Existing trends, cycle use or a multitude of other relevant factors were simply not considered.

Bad science is too common, and in some cases, there seems to be confusion between true scientific research and campaigning for helmet use. Some of the most widely-quoted papers have now been criticised to an extent that they can no longer be considered to be safe, yet they continue to be cited without question and as gospel.

Secondly, a difference between hospital and road casualty statistics is that the latter do not always include injuries suffered off-road, although they will usually include most serious injuries. It may be that helmets are more effective away from traffic and in particular in child play situations involving low-speed falls. If that is the case – and this remains more speculation than fact for the official wisdom that helmets are always beneficial has precluded research into where they might have most value – then perhaps the promotion of helmets should be clearer about where their advantages do and do not lie and embrace other forms of play activity and not just cycling.

It may be that play helmets would be better for such situations. A number of children have died in the USA, Canada and Scandinavia through strangulation when their cycle helmets became trapped. Few people know this, yet ironically it is the only indisputable evidence linking fatalities and helmets.

Thirdly, cycle helmets are probably much less capable of minimising injury than is commonly suggested. The design and testing of helmets is simplistic, mimicking only simple, low-speed falls. Helmets are neither designed nor tested to mitigate angular acceleration impacts, that lead to rotation of the head, which some doctors associate with more serious injuries. Helmet standards seem to be less rigorous than they might be and in important criteria have declined. Yet in tests for the UK Consumers Association, 16 out of 24 helmets failed to meet the European standards to which they were constructed and only 2 met the more demanding Snell standard, with one of these causing some impairment of a cyclist's vision.

Fourthly, there are wearing problems that are probably to a large extent endemic. Most people do not, and are unlikely to, wear a helmet properly.

Lastly, but importantly, there is risk compensation, whereby cyclists may ride more riskily because they feel better protected. This phenomenon is well acknowledged for almost every other activity where there is an element of risk, and is now being considered by the CPSC with regard to the latest US head injury statistics.

Head injuries in perspective

When considering the gain to be achieved through the wearing of cycle helmets, real-world evidence of performance is a key factor. But it is also important to keep head injury when cycling in perspective.

Road cyclists account for less than 1% of the people admitted to British hospitals with head injuries. Other road users suffer many more head injuries than cyclists, and still more occur in the home and at work.

Cyclists, on average, live up to 10 years longer than non-cyclists with healthier lives, which cannot mean that they are specially at risk.

It takes 8,000 years of average cycling to produce one clinically severe head injury, let alone one that might be mitigated by a helmet.

Helmets for motorists are now available that are said to be much more effective than those for cyclists, and better than air bags, interior padding or seat belts.

If helmets are beneficial, it would seem illogical – even discriminatory – to focus only on their use by cyclists. We seem to be getting locked into an infatuation with cycle helmets per-se, rather than meaningful injury prevention.

We all want to see fewer injuries on our roads and that, of course, includes injuries to cyclists. But what we should be keen to optimise is life-long health and life expectancy. It's easy to eliminate all cyclist injuries, simply by banning cycling or scaring people from the activity, which is much the same. But there is plenty of evidence that the net result would be shorter lives and worse health through heart attacks, obesity and a hundred other illnesses that result from our increasingly sedentary lifestyles.

It's becoming the view of many people that helmet promotion – not just mandation – has been a principal driver of the decrease in cycle use that has taken place over the past 10 to 15 years. This is leading to a vicious circle of less cycling, higher risk and worse public health.

On the other hand, there has been research over the past 2 - 3 years in Sweden, California and in Britain that suggests convincingly that by far the best way to make cycling safer is to encourage more people to cycle. For every doubling of cycle use, the risk per cyclist goes down by 37%. This alone can explain the much better cycling safety records of countries such as France, the Netherlands and Denmark, as well as trends in Britain since the 1920s. And as overall risk goes down, so does the risk of head injury.

Head injury rates in countries where cycling is common are well below those that have been achieved by cycle helmets anywhere. Contradictory though it may at first seem, less emphasis on helmets could bring about a lower risk of head injury and all the other health benefits to which we aspire.

Conclusions

So what is there to conclude?

Individual cyclists may have benefited from wearing a helmet ... but the odds would seem to be against it.

When large population samples are examined, it is difficult to detect any noticeable improvement in cyclist casualty trends. Worryingly, what change is to be found would seem to suggest that injuries, and sometimes injury severity, increase with helmet use.

The courts, too, seem not yet to have been convinced that wearing a helmet would have made any material difference to injury in cases in the UK where this has been contested, yet insurance companies now regularly offer less compensation after crashes to cyclists not wearing helmets, increasing suffering and hardship for many people through no fault of their own.

The clearest outcome of promoting helmet use has been to increase the public's perception of cycling as a dangerous activity, leading many people to forego the overall health benefits they might otherwise enjoy. Research has shown that helmet promotion campaigns are linked strongly to a decrease in the number of people cycling. This is likely to have resulted in a net decrease in the health and well-being of society, almost certainly outweighing by a large factor any gains that cycle helmets may have achieved.

I believe that there is a need to be much more honest about the real-world value of cycle helmets and to inform, rather than misinform, the public who deserve to know all the pros and cons. We should be careful to cite research that is credible and scientifically-sound.

Above all, there is a need for a more broad-based, holistic approach to cycling safety, that puts the risks of cycling more clearly into perspective and which takes account of the much wider implications for individual and public health.

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Please feel free to contact me if you would like references to the research quoted or if I can assist in any other way. My web site at <http://www.lesberries.co.uk/cycling> has various papers and other information that may be of interest.

In particular:

The effectiveness of cycle helmets: A more in-depth analysis of research to 2000, with full references, based on work produced for the courts.

<http://www.lesberries.co.uk/cycling/helmets/effectiveness.pdf>

Trends in cyclist casualties in Britain: UK specific data and comparisons.

<http://www.lesberries.co.uk/cycling/helmets/ukttrends.pdf>

Stepping stones to a better cycling future: The relative risk of cycling and evidence that safety is primarily dependant upon the number of people who cycle; by Malcolm Wardlaw.

<http://www.cyclenetwork.org.uk/conferences/autumn2001/mw.html>

Cycle helmets: a summary of research: References to research world-wide (not currently as up-to-date as it should be).

<http://www.lesberries.co.uk/cycling/helmets/research.html>