

# CYCLE HELMETS: The Background

## A presentation to CCN/CTC Cycle Helmets Workshop

John Franklin, 3rd April 2004

### Introduction

Cycle helmets have been around for a quarter of a century. At first they were promoted mainly by their manufacturers. 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 and health practitioners.

### Helmet research

Dozens of papers have been published. Many have predicted large savings in life and injury.

Dorsch	- 90% fatalities
Thompson, Rivara & Thompson	- 85% head injuries - 88% brain injuries

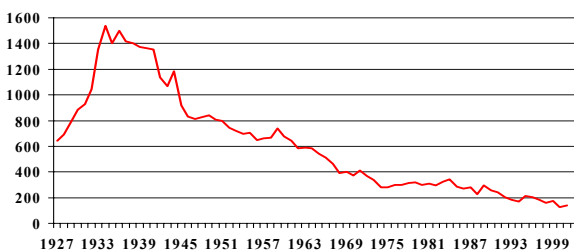
With big numbers like these, it's not surprising that the promotion of helmets has attracted so much interest.

Of course, what really matters is not the predictions that are made, but what has really been achieved in the real-world, over a reasonable period of time.

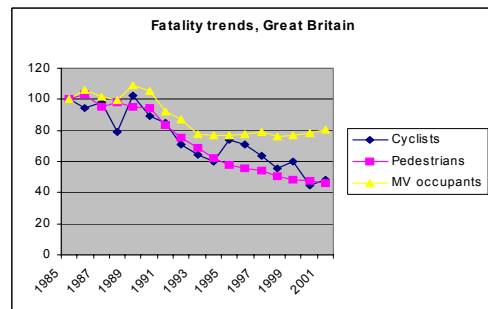
It is now possible to look at data from a number of countries to see the actual effect that cycle helmets have had on cyclist casualties, particularly those involving death or serious injury.

### Road casualties, Great Britain

In Great Britain, cyclist fatalities have been falling almost continually since 1934.

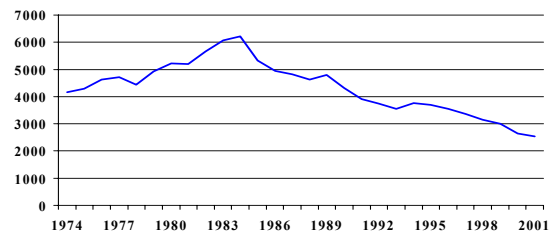


If we expand the period since 1985 and compare cyclists with pedestrian and motor vehicle occupants we see that the three trends moved in harmony for most of the period to 1994. Then there was an abrupt jump of 24% in cyclist fatalities, which was sustained for several years before fading towards the end of the 1990s.



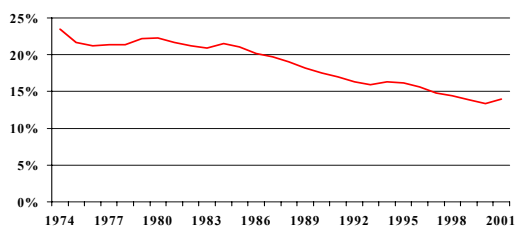
To put this jump into context, it is the largest percentage increase in fatalities above the trend line since 1933, whilst the next largest increase was only 10%.

From 1974 the number of serious injuries in Great Britain rose until 1984 and has fallen steadily since, although there was a 10% rise in these figures too in the mid 1990s.



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 again 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.

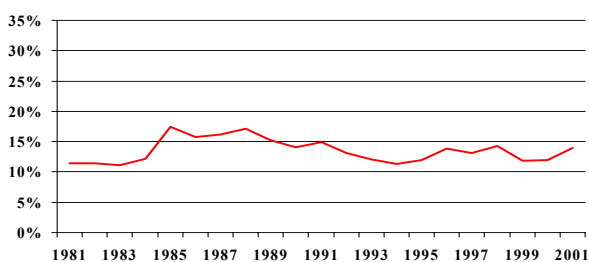
This rise in helmet use over a decade is significant, and might be expected to result in a detectable impact on recorded casualties to cyclists. However, for Great Britain as a whole, the trends in fatalities, serious injuries and severity ratio show no evidence at all of a beneficial ‘helmet effect’. Indeed, as helmet use became more common, there was the highest recorded increase in fatalities on record, and rises too in the average severity of injuries.

### Road casualties - Greater London

Greater London has one of the highest helmet wearing rates in Britain. Since the mid 1980s helmet use has risen from close to zero to around 50% today.

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. In 2001, fatalities were at their highest since 1989.

The trends in fatalities and serious injuries and

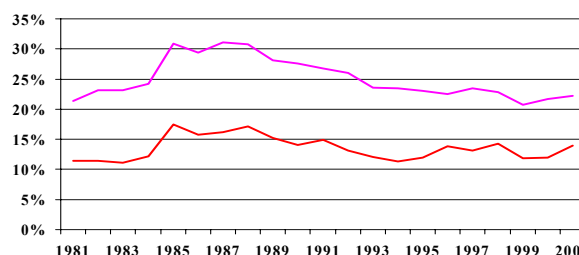


severity ratio for Greater London show no evidence of influence due to the increased wearing of cycle helmets. Indeed, serious injuries, both in total and by ratio, increased noticeably as helmet use became more common.

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 were very similar to those for cyclists for very many years. However, since the



early 90s the average seriousness of pedestrian casualties has decreased more than that for cyclists. Clearly, pedestrian trends have not been influenced by the wearing of helmets.

In Britain, other cities show similar trends. For example, in Cambridge, 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 (average 33%) in cycling brought about by the laws, or the concurrent trends in declining head injury across all road users.

Falls in cycle use were particularly marked amongst children — there was a decrease of over 90% in girls cycling to secondary schools in Sydney.

More recent official research suggests that head injuries fell by between 11% and 20%, both of which are 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, research cited by the Government suggests a 19% reduction in head injuries, but the National Travel Survey shows 22% fewer cycling hours. Some net reduction in minor injuries has been balanced by an increase in neck injuries, which are more likely than head injuries to be fatal. A

cost-benefit analysis says that increasing helmet use has not proved good value for money.

In the USA as long ago as 1988, Rodgers studied over 8 million cases of injury and death to cyclists over 15 years. 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.

In 2001, the Consumer Product Safety Commission, a US Government agency, reported that helmet use had risen over a decade from 18% to 50%. During the same period cycle use had gone down by 21%, yet total head injuries had increased by 10%. Cyclists are now 40% more likely to suffer a head injury than a decade ago.

In Canada cycle helmet use reached 50% by 1997, but there was no detectable impact on cyclist fatalities.

In 2002 the Canadian Medical Association published a review of a cycle helmet law in Nova Scotia. The headline conclusion was that in 3 years cycle helmet use had more than doubled from 36% to 86% and the number of head injuries to cyclists had halved. The CMA clearly had its concerns about the research because in the same edition of their journal there was another article from a senior health professional 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. Head injuries had, at best, only fallen in line with cycle use.

### **Why the shortfall?**

There is, then, 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, cycle helmets are probably much less capable of reducing injury than is commonly suggested, and modern helmets are worse than those of the 1980s as standards have declined. The design and testing of helmets is simplistic, mimicking only simple, low-speed falls. Importantly, they are not designed, nor proven to be effective in, mitigating angular acceleration impacts, leading to diffuse axonal injury

(DAI), which is the most common cause of brain injury sustained in road crashes. Indeed, there is evidence that helmets may make some injuries worse by converting direct forces to rotational ones.

Secondly, there are wearing problems. According to US research, 96% of adults and children do not wear helmets correctly.

Thirdly, there is risk compensation, whereby cyclists may ride more riskily or in more hazardous places because they feel better protected. There is evidence that this applies to children.

Last, but by no means least, is the poor quality of most helmet research, that has led to expectations from helmets that are unlikely to be met.

### **Research - Seattle (Thompson, Rivara & Thompson, 1989)**

In Seattle a comparison was made between 145 children who visited hospital for a head injury, and a control group of 480 children who had, in one way or another, simply fallen from their bikes. Many of the latter did not even visit a GP. 2.3% of the cases wore helmets, compared with 21.1% of the controls. The reduction in head injury due to helmets was calculated as 85%, the figure that is quoted to this day around the world to support the case for helmet use and which has been prominent in the justification for every law that has been introduced.

As well as the considerable difference in helmet wearing between the two groups there were other differences which have attracted much criticism from the few people who are aware of the facts.

The control group belonged to a single health cooperative in one part of Seattle and comprised predominantly white, middle class children, riding with their parents in parks. The cases were more often black or other races riding alone on busy city streets. There was not a single case of a helmeted cyclist in collision with a motor vehicle. The researchers did not differentiate between head and face injuries, although most were to parts of the face that a helmet wouldn't protect.

At the same time as this research was being carried out, there was an even more extensive survey of helmet use in Seattle, and Frederick Rivara was a link between the two projects. 4,501 child cyclists were observed cycling around Seattle, and of these just 3.1% wore helmets. This is not statistically different from the 2.3% of the hospital cases who were wearing helmets.

If you believe that the control group of 480 children, with a helmet wearing rate 7 times that of 'street'

cyclists, is typical of cyclists generally in Seattle, then helmets prevent 85% of head injuries.

If you believe that the 4,501 cyclists observed riding around Seattle are more typical of the norm, then helmets make no significant difference.

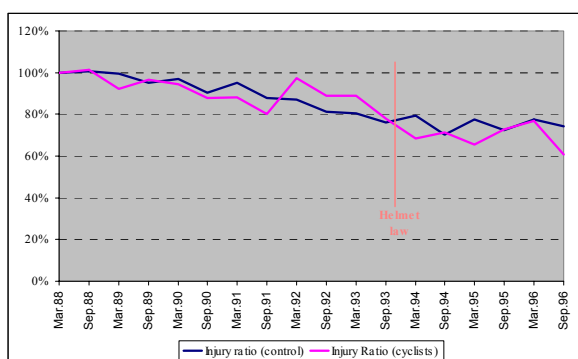
### Research - New Zealand (Scuffham et al, 2000)

In 2000 an assessment was made of the effect of the New Zealand helmet law. Based on 30,000 cyclists, it reported a 19% reduction in head injuries compared with predictions based on pre-law levels.

The first thing to notice is how much more modest this 19% benefit is compared with Thompson's 85%.

The New Zealand conclusions look different, however, when the full data – not published in the report – is viewed.

Head injuries to cyclists were compared with those of the population at large. The first thing to notice is how all these other groups have experienced the same proportional reduction in head injuries over the



period as cyclists – but without wearing helmets! The reason why cyclist head injuries fell post-law relative to projections was that cyclist injuries had increased significantly above previous trends in the two years preceding the law, perhaps as a result of increasing helmet use. These years had a strong influence on the predictions of how many injuries there would have been without the helmet law. The law simply restored the similarity between cyclist trends and those for the population at large that existed prior to the run-up to legislation.

### Research - Department for Transport (Towner et al, 2002)

At the end of 2002 the Department for Transport issued its review of cycle helmets. Some of us were eagerly awaiting this, hopeful that it would at last bring some balance into the subject. We were greatly disappointed.

It concluded that there was considerable scientific evidence in support of helmet effectiveness, and did this on the basis of 16 studies which just happen to coincide with those chosen for an Australian study in 2000 to justify continuation of their helmet laws. So much for an 'independent' review!

To their credit, the DfT researchers identified a considerable number of shortcomings in these studies – sufficient to void at least half of them – but they disregarded these in their overall assessment.

Although the research project was to evaluate the evidence both for and against helmets, not one single paper unsupportive of helmet use was reviewed. There is no reference to traffic casualty trends where helmet use has become common, no reference to hospital treatment trends, and no reference to evidence that shows that helmets have sometimes increased injury. Many other crucial topics, such as risk compensation and angular acceleration, are noticeable by their absence.

### Head injuries in perspective

The failure of helmets to deliver what has been promised of them is only part of the picture. For whilst helmet promotion puts across a picture of cycling as an inherently hazardous thing to do, research shows the contrary: that cycling is in fact one of the safest of activities.

Road cyclists account for under 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.

For children, on road or off, cycling is involved in only 7% of head injury admissions and just 2.4% of all child hospital admissions.

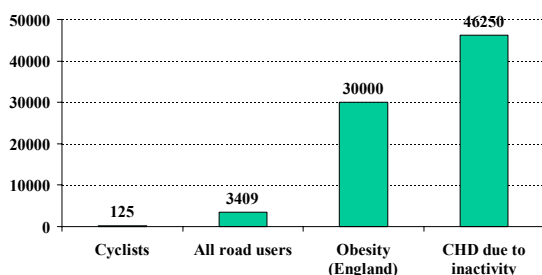
Whilst 82% of cyclist deaths involves head injury, for pedestrians and motor vehicle occupants the proportion is 86%. Cyclists are only half as likely as the other groups to die from injuries to the abdomen and thorax.

It takes over 3,000 years of average cycling to suffer a serious head injury, whilst the risk of death through head injury is very small indeed.

Cyclists, on average, live at least 2 years, and perhaps as many as 10 years, longer than non-cyclists with healthier lives. Research shows that cycling to work regularly is the most effective means known of increasing life expectancy. None of these things can mean that cyclists are specially at risk

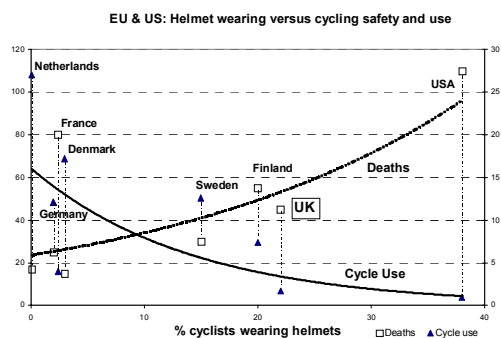
Research has shown clearly that by far the most effective way to reduce further the risk when cycling is to get more people to cycle.

The real threats to modern society are shown here. Yet as well as making cycling safer for those who



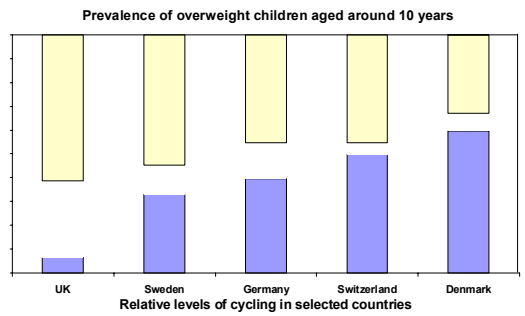
already cycle, more cycling has enormous potential to address illnesses such as obesity and heart disease that are the principal causes of premature death in Britain, more than 500 times more likely to kill than cycling.

More cycling means better cycling safety with potential benefits well beyond anything like to be



achieved by helmets. The countries with the most cycling and best safety are also those with least helmet wearing.

Furthermore childhood obesity, being in the main a consequence of inactivity, is inversely related to cycle use, and thus to helmet use.



### Helmets in the real world

At best, helmets have proved ineffective as a road safety measure, and may well increase the risk of injury.

Almost everywhere that helmets have been promoted cycle use has fallen, sometimes by over half. Getting more people to cycle side-by-side with helmet promotion is going to be an uphill task.

Indeed, cycling promotion initiatives continually come up against barriers caused by the helmet philosophy, whether it be Bike Week, cycle training, participation in mass rides or simply what sort of pictures you can publish of cyclists.

We all know about the high-profile court cases where insurers have sought to reduce compensation for cyclists not wearing helmets. CTC has achieved worthwhile successes here. But there are many more of these cases where cyclists settle for much less than they are entitled, for fear of going to court, or simply out of perceived guilt arising from helmet propaganda.

Helmets are a serious distraction. As one driver famously put it: "I wouldn't have to drive more carefully if you lot wore helmets". The road safety establishment frequently puts helmet promotion ahead of other activities that might make cycling safer or more pleasant.

Finally, even without Martlew, we are moving towards compulsion by stealth. At present most people's lack of knowledge – even a lack of awareness that there is more than one view – makes them easy sympathisers for BHIT and Martlew. Witness also the enthusiasm of the posties' union for compulsory helmets. To change attitudes is going to be a huge task and one where the help of people at local level is going to be crucial.

The pressure for helmets is largely emotional. We need to make the debate an objective one and to challenge the misleading claims that are so frequently put about as fact. The health gains through more cycling are our major strength.

But unless we resolve this issue soon, it will continue to dog cycling and dash any hope of large increases in cycle use for years to come.