



# injury

## PREVENTION

Journal of the International Society for Child and Adolescent Injury Prevention

### Editorials

## A double standard? Disease *v* injury

During the spring of 1998, after lengthy investigation and frequent discussions among federal and provincial health ministers, the Minister of Health announced a decision to financially compensate Canadians who had become infected with hepatitis C after 1986. Why 1986? This date was chosen because it was only subsequent to 1986 that the blood banking system had a proven method of screening, and thus, presumably, preventing hepatitis C being contracted through blood transfusions. The reasons for not adopting the screening procedure immediately after that date remain unclear. Nevertheless, the decision to compensate was an admission by government that it had an obligation to act once this preventive technique was available.

I find the logic behind the Health Minister's tough decision persuasive and irresistible on two counts. He has been criticised for not compensating all victims, regardless of when they became infected, but this seems illogical and he continues to resist the persistent pressure to do so. The second point of agreement is the key one; establishing a principle that governments may be held responsible if they fail to use proven methods of disease prevention.

Of what conceivable interest is this account to readers of *Injury Prevention*? To begin with it illustrates the pervasive double standard that applies when policy makers consider diseases and injuries. This split thinking is familiar to readers of this journal. In few (if any) countries are injuries viewed as a disease. Therefore, any principles that would be applied by the public health authorities or any other sector responsible for the prevention of diseases are usually abandoned when confronting analogous injury prevention challenges. As has been pointed out many times previously, health departments show little inclination to override decisions of other branches of government when it comes to injuries. The exact opposite is true, however, when the disease involves an outbreak of meningitis or the contamination of a food product. In such instances, health departments have the obligation and power to step in and do whatever is needed to control the causative agent. The Canadian decision now makes it appear that there is a legal and moral obligation to do so as well.

The important lesson in the hepatitis C story is the government's agreement to compensate victims for its failure

to apply knowledge that had been shown to be effective in preventing this disease. Think about that for a moment, and then consider the implications if the same principle were applied to injuries. The ramifications are enormous. Choose any example you wish and you will readily appreciate how radically different the injury prevention picture would be if the same principle of government responsibility applied. Why should any branch of government, not just health, not be held to be similarly responsible for refusing to use what is known to be effective in the case of injuries.

There are numerous examples that serve to illustrate the point. The one I have chosen is speeding in school zones and residential neighbourhoods. There is no country in which this problem does not exist. Yet the facts are these: it has been shown that a reduction in speed of 1 mph reduces the injury rate by 5%.<sup>1</sup> It has also been established that the proportion of pedestrians who will die when hit by a car at 50 mph is 90%, but falls to 40% at 40 mph and 20% at 30 mph.<sup>2</sup> The abbreviated injury scores increase from 0.5 when a car is moving at 10 mph to 6.4 at 38 mph, and part of the reason may be that at higher speeds a motorist's field of vision is restricted.<sup>3</sup> Finally, and importantly, recent work in the UK makes it clear that speed cameras are highly effective in reducing these injuries.<sup>4</sup>

Surely, if these data are correct, the logic of reducing and enforcing speed limits becomes every bit as compelling as screening for a blood contaminant. If this principle were accepted, logically those injured by speeding cars should be entitled to compensation from governments who have failed to apply this proven preventive measure in the same way as were victims of hepatitis C.

It all seems so amazingly simple that I wonder why this has not happened. Why have we not seen this argument being put forward by victims of speeding or their families? Could it be that they have convinced themselves (or have been convinced by others—including the media)—that they themselves are really to blame, not the speeding driver? Or could it be that they believe that being struck by a speeding car is truly an accident and not preventable? Food for thought.

## FoWoCo, Rijstafel, and FiWoCo

I dislike acronyms, especially those I don't immediately understand. For a long while I thought the abbreviation for the Melbourne meeting had something to do with a character from *Star Wars*. Now that I am much older and much smarter, I am pleased to report that it only took me a few months to decipher FoWoCo.

For those who were not able to attend FoWoCo—the Fourth World Conference in Amsterdam—this is a brief report to make you sorry you missed it. The meeting was blessed by wonderful weather, a great city, and good attendance. Amsterdam itself was a treat for those who had the time to discover its many treasures, artistic and

otherwise. Even for the rest of us—the hard working, excessively conscientious types—it was still rewarding. The chance to meet old friends and make new ones is precious and I feel certain most of those who attended felt, as I did, that this was as important as the scientific program, perhaps even more so.

The executive of ISCAIP met over a very spicy meal, and, amazingly, in spite of jet lag, managed to make several seemingly rational decisions. The most important of these from the viewpoint of journal readers is the decision to recommend separating the journal subscription process from that of ISCAIP membership (details are given in the ISCAIP column). The reasons behind this are somewhat complex, but it seemed apparent that it would be best for both parties. So, in future, when your membership is due for renewal you will receive a separate, smaller bill for the Society dues alone. ISCAIP members in good standing will continue to receive the same discount to the journal as they have in the past. As for *Injury Prevention*, the good news is that despite somewhat slow growth in the number of subscribers, our publishers remain fully supportive. The journal is highly regarded by those who are familiar with it, but it is evident that there are far too many individuals—and

especially too many institutions—that are still not aware of its existence. I urge all readers to do what they can to ensure that their library subscribes. Unless we are quickly able to recruit several hundred more subscribers we may be forced to consider other options to ensure our survival. The most likely of these options is to include material related to injury prevention in adults. Many of our readers and many members of the editorial board would like us to move in this direction immediately, but a majority prefer to wait. I invite readers who were not in Amsterdam to write to me with their views on this important issue.

What about Rijstafel? The idea is to move from the least hot of four dishes to the most spicy, thereby, presumably, developing tolerance as you go along. When I first tried this marvellous meal over 30 years ago it did not seem particularly daunting. At FoWoCo I barely made it past the first dish! As a scientist I can only conclude that either I am getting older or the spices are much stronger. I prefer the latter explanation but fear the truth is closer to the former. The question now is: What are we to expect from FiWoCo, the meeting to be held in New Delhi? Even if it promises to be equally spicy, I nevertheless urge you to begin now to make plans to attend.

## Lamentations of a bewildered editor

As I wrote this, I asked myself why I was writing messages aimed mostly at those who are not likely to read them. The best answer I could find was that I knew of no other way to reach those I wanted to reach. This paradox arises because there may be authors “out there” who have never read a single issue of *Injury Prevention*. Fortunately, my semblance of sanity is preserved because another part of the message is also aimed at authors who do read the journal, but perhaps not as carefully as they should. Everyone needs to be reminded of our international orientation and need to keep this in mind when papers are being prepared.

Papers submitted to *Injury Prevention* are as much our lifeline as are our readers. Because ours is a new specialty, we are more inclined than many other journals to work with authors who have promising ideas but less than perfect manuscripts. To this end, we try to provide constructive reviews and, when needed, assistance in editing to ensure that the message is presented clearly. In response, most contributors work hard to improve their paper and eventually resubmit.

In the course of preparing an original submission or a revision, authors greatly help themselves when they keep in mind one of the cardinal rules of publishing: “know your audience”. The best possible way to do this is to be thoroughly familiar with the journal to which you intend to submit your paper. It follows, then, that the best way to do this is to be able to regularly read the publication in question.

This brings me back to the first message. To be a regular reader you must either subscribe personally or must have your library do so. Those who are able to peruse a copy and who are preparing a paper for us will discover several important points that improve the likelihood of having their paper accepted. Although I would prefer that these discoveries be made by persuading more authors to subscribe—the real goal of this sermon—I will, nevertheless, highlight a few key points.

Regular readers should need no reminder that *Injury Prevention* is aimed at an international and interdisciplinary audience. The former characteristic means that a writer must make a genuine effort, especially in the opening paragraphs, to capture the interest of readers from abroad. The best possible way to do this is to have systematically reviewed all relevant literature, not just studies from one's own country.

A systematic review is not only an essential ingredient of good authorship, it is also an absolute requirement of good science. Any original contribution must begin by placing the work in context of what others have done. A good introduction convinces the reader that the author is familiar with similar studies and has reviewed them in a suitably critical fashion. It should then be able to state why the new offering represents an improvement on what has gone before. Occasionally a paper is written to verify or replicate earlier work; this is perfectly acceptable but if this is the goal it is essential to explain why replication is needed.

I most frequently rap knuckles over introductions that are too parochial—those that assume that the entire audience are fellow Brits, Americans, or Canadians. Another cause for chastising is failure to read, or take seriously, the instructions to authors published in each issue. Too many manage to ignore important elements such as how journals cited should be abbreviated and punctuated in the reference section. Often abstracts are too long and keywords not as informative as they might be. Some might see all this as nit-picking, but it is discourteous and not something that earns the goodwill of an overworked editor.

Familiarity with any journal will provide authors with a sense of how long papers should be, how many tables or figures they typically include, how references should be listed, the importance of a good abstract, and a guide to choosing useful keywords.

Unfortunately, it is often all too apparent that many authors or their institutions are not subscribers and thus not in the least familiar with the journal. I find this difficult to understand because I assume that if a journal is one that you value sufficiently to wish it to publish the fruits of your hard work, it would also be one whose contents are of sufficient interest to warrant the modest cost of a subscription.

I B PLESS  
Editor

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*Guest editorial*


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## Tap water scald prevention: it's time for a worldwide effort

The Injury Classic by Feldman *et al*,<sup>1</sup> reprinted in this issue (page 238), brought tap water scald burns to the attention of pediatricians and others as an example of a predictable and readily preventable injury. Building on the work of Moritz and Henriques,<sup>2</sup> who determined the duration of exposure to hot water that would result in full thickness epidermal burns of adult skin at various temperatures, Feldman's article not only looked at the epidemiology of these burns in children but also put forth suggestions for prevention. Applying the Haddon matrix<sup>3</sup> as well as the common means of injury prevention—education, environmental/technological, and legislative/regulatory—to the prevention of tap water scald burns provides injury control teachers and researchers with an excellent model for the prevention of injuries in general.<sup>4</sup> In reviewing the literature in preparation for a recent talk at the 4th World Conference on Injury Prevention and Control in Amsterdam (presentation at conference, 18 May 1998), I discovered articles on the epidemiology and prevention of tap water scald burns from Australia, Canada, China, France, Israel, New Zealand, United Kingdom, United States, and other countries. At the conference, I was informed by several people that these scald burns are a significant problem throughout the European Community, as well as on other continents. Tap water scald burn prevention methods will need to be varied from country to country.

Before I review some of the efforts to prevent tap water scald burns in the United States, I would like to mention how Ken Feldman and his work affected me personally. Sometimes it is truly “by accident” that our careers take a major change in direction, and this certainly happened to me. When I was a third year medical student in 1974, I was sure that I wanted to become a geneticist. Since the University of Washington had one of the best genetics programs in the United States, my wife and I decided to take our infant daughter and spend the summer in Seattle, where I could get exposure to genetics. I had heard that a former Wisconsin alumnus, Ken Feldman, and his family were living there. When I called Ken for information, he informed me that he would be gone from his home that summer and that our family was welcome to occupy his house. Although we did not get to know the Feldmans well, I knew that he was working in the area of child abuse prevention; and several years later, when I saw his name on an abstract to be presented at the plenary session of the Ambulatory Pediatric Association annual meeting, I went to hear the paper and to say “hello”. The paper he presented dealt with prevention of tap water scald burns and was later published as the Injury Classic reprinted here.<sup>1</sup> As I left the large assembly hall, I remember discussing with others how important this work was and how a one time action—lowering the water heater thermostat to 120–130°F (48.9–54.4°C)—could result in prevention of these devastating burns to children. During the next year, I completed my pediatric residency and was invited to become a member of the faculty at the University of Wisconsin. By that time I had decided to become a general pediatrician. Coincidentally, the pediatric burn doctor was leaving our department, and I was asked to fill that role. Feldman's

work had already made a great impression upon me and had resulted in my taking a deeper interest in injury prevention.

The article by Feldman *et al* pointed out that tap water scald burns were often more severe and disabling, more extensive, and required longer hospitalization than other types of scald burns. Children under 5 years accounted for a higher proportion of victims than would be predicted by the population distribution alone. In about 30% of the reported cases, the cause of the burns was intentional injury. Feldman tested water temperature at homes in Seattle and found that 80% of them had a measured hot water temperature of >130°F (54.4°C) at the tap. He pointed out that the one time lowering of the water heater thermostat to below 125°F (51.7°C) would result in passive protection from hot water burns. Realizing the importance of getting water heater manufacturers to lower the preset temperature of water heaters [then 150°F (65.6°C) for electric water heaters and 140°F (60°C) for gas water heaters], Feldman petitioned the United States Consumer Product Safety Commission to establish regulations that would require reduction of the preset water heater temperature. Although these efforts failed initially, the American Academy of Pediatrics (AAP) introduced tap water scald burn prevention into an early version of their office based anticipatory guidance program, The Injury Prevention Program (TIPP).<sup>5</sup> In addition, Feldman began to work on local legislation and on model state legislation with the AAP. He also went on to publish several other articles related to tap water burns.<sup>6–8</sup>

Injuries, like diseases, are dependent on host, agent, and environmental factors. *Host* risk factors for tap water scald burns include age (<5 or >65 years) and presence of physical or mental disability.<sup>1, 6–9, 10</sup> These risk groups account for up to 88% of those injured.<sup>9</sup> The *agent* of injury is the thermal energy of the hot water, and *environmental factors* include lack of supervision in a place where the host cannot readily remove him/herself from the hot water. Brief exposure to hot water at a temperature of 140–150°F (60–65.6°C) will cause full thickness burns in adult skin in 2–5 seconds<sup>2</sup> (faster in children<sup>7</sup>). These burns, some of which are associated with abuse, may result in permanent disfigurement (scarring and contractures) or death.

Office based and public education programs focused on raising awareness of the danger of hot tap water,<sup>11–14</sup> encouraging people to test the maximum temperature of the hot water at the tap, and if high, turning down the water heater thermostat until the desired temperature of 120–130°F (48.9–54.4°C) was achieved. This one time action would passively protect all members of the household because a contact time of 30 seconds to 10 minutes is needed for an adult to receive a full thickness burn at these temperatures.<sup>2</sup>

Members of the AAP and others formed coalitions to pass state legislation requiring water heaters to be preset by manufacturers at safe temperatures and to display labels warning about the danger of hot tap water burns. These efforts and the threat of litigation caused water heater manufacturers to agree in the late 1980s to a voluntary

standard that would preset all electric water heater thermostats at 130°F (54.4°C) in the factory and would change the “detent” position (the thermostat setting used by the installer) of gas water heaters to 120°F (48.9°C).<sup>15</sup>

Five years after the passage of a 1983 Washington State law to preset water heaters at 120°F (48.9°C), and after extensive educational efforts, approximately 80% of the homes in Seattle had a maximum hot water temperature of <130°F compared with only 20% in 1977.<sup>8</sup> Also, the admission rate for children with these burns was reduced by more than 50%, with most of the reduction occurring in unintentional burns; thus, the proportion of abusive burns increased from about 30% to 47%.

Other technological/engineering efforts have focused on the use of antiscald devices that are temperature sensitive and/or pressure balanced. Unfortunately, if these devices are attached to the bathtub faucet, they only protect individuals from burns at that faucet. In our experience, infants also may receive burns while being bathed in a sink. In addition, some of the retrofitted antiscald devices often become clogged with debris and are then removed from the faucet.<sup>16</sup> In the United States, many jurisdictions have building codes that require antiscald devices in the bathrooms of all new housing. The most effective of these devices limit the water temperature to 120°F (48.9°C) at the faucet. If attached to the outlet of the water heater, these devices could allow small volume water heaters to store water at very high temperatures but deliver water at a safe temperature to all faucets throughout the house. Thus, sufficient volumes of hot water could be available so that families would not “run out of hot water”. Such outflow devices are therefore very important in countries where small household water heater volumes exist.

Using the information generated by Feldman and others, the worldwide injury prevention community is now ready to mount a global effort to prevent burns from hot tap water.

Perhaps this could be organized through the International Society for Child and Adolescent Injury Prevention.

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## ISCAIP report

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### Looking to the future

I am writing this having just returned from the 4th World Conference on Injury Prevention and Control in Amsterdam, although you will be reading it some months later. The ISCAIP conference was a great success; many felt it was one of the highlights of the entire meeting. From this conference and the ISCAIP business meeting, a number of important issues relating to the future of ISCAIP were discussed.

#### Inclusion of intentional injuries

The conference featured a lively debate and a straw poll on whether ISCAIP should include intentional injuries in its scope and mission. The debaters and attendees concluded that the answer to this question is overwhelmingly yes. While respecting the views of dissenters, most believe that ISCAIP should be concerned with injuries to children and adolescents regardless of how they occur, and that in fact determination of intent is often difficult, sometimes impossible, and occasionally irrelevant. In many situations, prevention may be the same regardless of the intent; safe

storage of guns can prevent unintentional firearm injuries to young children as well as suicide by guns in adolescents. On the other hand, we realize that much of the field of violence is the bailiwick of criminology, not injury control, and that we should recognize the important contributions these individuals have made in the past and will continue to do so in the future. We also realize that in some countries, inclusion of intentional with unintentional injuries may not be feasible. The work of some people on unintentional injuries may be hampered by their association with the intentional injury field, particularly criminal justice. Fortunately, most felt this was not an issue for them. Finally of note is that *Injury Prevention* does not publish work related to child abuse because of the excellent journal available for these studies, the *International Journal of Child Abuse and Neglect*.

#### Mission and activities of ISCAIP

It became clear through discussions at the business meeting, presentations and comments during the ISCAIP conference, and informal discussions over coffee that ISCAIP



should be more active and more activist. There are many issues on which ISCAIP can and should have an influence, especially with the further maturation of the European Union. ISCAIP represents the leading experts in the world on measures to prevent injuries to children and adolescents. It therefore can potentially influence standards and public policy, and has, in fact, a duty to speak out on behalf of children. For example, one issue discussed at length was the development of a position statement on a universal mounting system for infant and child seats in motor vehicles. Such a system will make it easier to use these devices and increase their effectiveness, yet its adoption appears to be mired down in the political process between manufacturers, regulators, and standard organizations. Another issue was advocacy against the export of unsafe or outdated products from industrialized countries (where in some instances they have been banned) to less industrialized parts of the world. This advocacy of ISCAIP must be done in a way which is sensitive to the cultural, social, and economic differences of the countries of our members. The leadership of ISCAIP wants to hear from you on what issues you think we should develop and disseminate a formal position statement.

We also heard the need to improve our communication structure through ISCAIPNET and our web site, provide a research and writing consultation service to members, and be more responsive to members' needs. ISCAIPNET is a valuable tool by which members can communicate and take advantage of the wealth of expertise in our Society. I would like to see us have a regular newsletter on ISCAIPNET as well as use it to alert members to important injury control issues in a timely fashion. Our web site should be expanded to serve as an important repository of information on activities and resources for child and adolescent injury prevention throughout the world. We need volunteers for both these activities.

I have written previously in this column about the development of a research consultation service. The sentiment among our members was to expand this to a writing consultation service as well, that is, expert editorial assistance in writing a peer reviewed publication. The Executive Committee will develop standing committees within the Society to spearhead these efforts and work to get members more involved. These standing committees will serve to coordinate these activities as well as provide a more formal

role for individuals willing to contribute time and effort to ISCAIP. We have wonderful expertise within the Society and need to use it more fully, both to benefit our members, as well as to accomplish our goal of decreasing injuries to children and adolescents.

One issue of concern was the ability of the Society to grow and mature with meetings only every two years. We would like to encourage, and will help coordinate, our members holding ISCAIP meetings as part of other ongoing meetings of their respective professional organizations around the world. This information will be disseminated over ISCAIPNET and will serve to make ourselves more visible and cohesive.

### **ISCAIP, *Injury Prevention*, and the BMA Publishing Group**

As Barry Pless mentions in his column, one of the more important topics at the meeting was the decision to financially and administratively separate *Injury Prevention* from ISCAIP. There were many reasons to do so; one of the large advantages to ISCAIP is that our staff will be able to devote more time to Society business and have fewer administrative responsibilities for subscription renewals. We will retain the journal discount for ISCAIP members, thanks to the generosity of the BMJ Publishing Group, and *Injury Prevention* will remain as the official journal of the Society.

As we do this, we must, however, remind ourselves of the need to foster both the journal and the Society. Subscriptions to the former and membership in the latter are both small, reflecting that both are still in their childhood (even if the leadership of the one is graying and the other balding). The journal and Society serve as important avenues to advance the cause of injury prevention for children and adolescents. Each of us must be a bit of an evangelist and bring new members into the fold of both the journal and the Society. If we truly believe in our cause, this should be easy.

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OPINION

*Editor's comment:* This issue's Opinion/Dissent topic is a reproduction of a debate on helmet laws that appeared in *Australian Doctor*, 27 February 1998 in a section entitled Controversies in Medicine. The resolution debated was, "Laws enforcing helmet wearing for cyclists do more harm than good". *Australian Doctor* has kindly given permission for us to reprint this debate in its entirety.

The opponents are well matched: Dorothy Robinson is a respected statistician whose criticisms of helmet laws have appeared in various publications. Carol Acton, a frequent reviewer for *Injury Prevention*, is an oral surgeon. I have locked horns with Robinson in an exchange of letters in the *BMJ* and think I won. But in fairness to our readers, I will let the debaters speak for themselves.

## Helmet laws and health

Dorothy Robinson

This article shows that bicycle helmet laws have done more harm than good. They have not produced any noticeable reduction in head injury rates. But, by discouraging cycling, have deprived many of healthy exercise and pollution-free transport, adding to the billions our sedentary lifestyle already costs.

Effective road safety initiatives are great news. The speed camera/anti-drink-driving campaign, introduced in Victoria about the same time as the bike helmet law saved the community \$200 million in 1990 for just \$5.5 million. Figure 1 shows the size of the drop in pedestrian fatalities.

However, ineffective road safety measures may cost money, without offering much benefit. Figure 2 shows the percentage of

cyclist hospital admissions involving head injury in Western Australia (WA), together with the same data for pedestrians, car drivers, and occupants. Percentages have changed over time, but cyclists seem no different from other road users. There is no sudden change in response to a law which increased helmet wearing from less than 39% to more than 80% of cyclists.

Unlike the effect of the drink-driving/speed camera campaign, benefits of bicycle helmets seem too small to show up. Yet the cost of the WA helmet laws, pre-law promotion and purchase of helmets was \$18 million, 3.3 times more than the highly successful Victorian road safety campaign. How much more might we have gained had the money been spent on more effective measures?

A similar lack of effectiveness has been found elsewhere. In New Zealand, no detectable effect of increased voluntary helmet wearing was found on percentages of cyclists with head injuries. In Victoria, with three years post-law data, percentages of cyclists with head injury after car-bike collisions were found to be no different from predicted pre-law trends. Indeed, excluding a small number of unknowns, 76% of fatally injured cyclists in Victoria in 1991-92 and 80% of fatally injured cyclists in New South Wales (NSW) in 1992-94 were wearing a helmet at the time of the crash. Helmet wearing in cyclist fatalities was therefore no different from the 75% of Victorian and 80% of NSW cyclists observed wearing helmets in official surveys.

A puzzle is why some case-control studies have apparently found benefits of helmets, but no effect of laws has been observed in hospital records, at least when properly adjusted for numbers of cyclists and trends common to all road users (for example fig 2). A problem is that case-control studies must adjust both for trends and differences in attitudes and riding styles of those choosing to feel safe and wear helmets compared to those deciding otherwise. If adjusted incorrectly, differences in injuries

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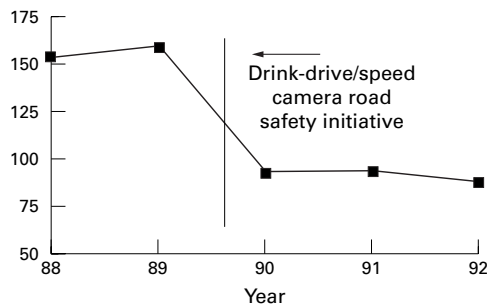


Figure 1 Pedestrian fatalities by year, Victoria.

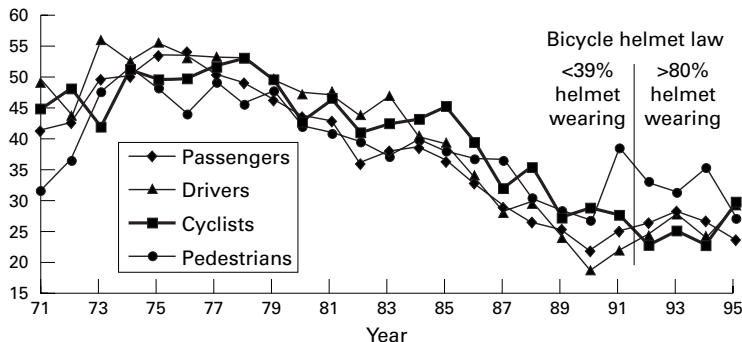


Figure 2 Head injury percentages, WA road users.

caused by differences in riding behaviour of helmeted and unhelmeted cyclists might be attributed to helmets. Cyclists forced to wear helmets may also feel more protected and so take more risks. Such effects are difficult to estimate. So it is better to judge the benefits of helmet laws by their effect on head injury statistics. And consider them failures if no effect is apparent.

In contrast to effects on head injuries, the effect of unpopular helmet laws on cycling activity is readily seen. In Melbourne, surveys were conducted pre-law in May 1990 and post-law in May 1991, at the same 64 sites and same observation times. Counts of child and adult cyclists declined by 42% and 29% respectively. In total, 297 more helmeted cyclists were counted than pre-law, compared with 1100 fewer cyclists. It's as if the law didn't so much encourage helmet wearing as discourage cycling!

The same happened in NSW, the only other state to conduct reliable pre-law and post-law counts, but only of children. Across-the-board reductions were found, in metropolitan, inner rural and outer rural areas, at road intersections, in recreational areas, and at school gates. Altogether, 2215 (36%) fewer cyclists were counted, compared to an increase of only 1019 cyclists wearing helmets.

Claims that numbers of cyclists have now "recovered" are misleading. Cycling was increasing before the law, so we need to compare current levels with the increase that might have been expected without the law, or estimate discouragement by other means. A survey of 1210 secondary schoolchildren questioned in Blacktown, Sydney, found helmet restriction was the

most common reason (33.8%) for not having ridden last week. Other reasons were not owning a bike (33.4%) and safety fears (11.8%). A telephone survey of adults in WA found a figure equivalent to 64% of current adult cyclists would ride more if not legally required to wear a helmet.

Reductions in cycling mean reductions in healthy exercise and discouragement of non-polluting transport. Life years gained due to the healthy exercise from cycling, even without a helmet, have been estimated in the UK to outweigh those lost by 20:1. The risk from being sedentary is similar in magnitude to smoking 20 a day. If another 40% of Australians undertook regular, moderate, and effective exercise the community would save \$2.4 billion/year in reduced costs associated with heart disease, low back pain, absenteeism, and workplace productivity.

Other unintended social consequences of helmet laws include a 12 year old aboriginal, owing \$2000 in helmet law fines, threatened with 40 days jail, and the jailing of a pregnant woman and a girl aged 15 (for two days) for failure to pay fines.

In summary, cycle helmet laws have not produced any noticeable reduction in head injury rates. But, by discouraging cycling, they deprived many of healthy exercise and pollution-free transport, adding to the billions our sedentary lifestyle already costs. Helmet laws have therefore done more harm than good.

Dorothy Robinson is senior statistician at the University of New England in New South Wales. She has published research on the impact of Australia's bicycle helmet laws and has used a bicycle as her main means of transport since she was 17.

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## Helmet laws and health

Caroline Acton

In 1884, Louis Pasteur told his students that "when meditating over a disease, I never think of finding a remedy for it but, instead, a means of preventing it".

That laws enforcing helmet wearing for cyclists do more harm than good is an ethical, philosophical, and scientific debate. As stated by Unwin in 1996, the law has principles, precedence, and consequences, all of which have undergone much evaluation and heralded benefits. These are a reduction in the number of head injuries in cyclists as well as a reduction of their severity in most Australian states.

Pasteur's principle of prevention may be applied to either the incident or the injuries resulting from it. The effectiveness of an approved helmet in preventing head injury, both serious and minor, is proven worldwide by case-control studies.

The riding behaviour of injured cyclists has been examined rigorously and most investigations negate the "risk compensation" theory, that is, that riders who wear helmets take more risks. This is the argument mooted by those who do not advocate such a simple safety measure.

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It could also be asked whether the health benefits of this intervention outweigh the disadvantages of any lost civil liberty. This liberty comprises an exposed head, which in the event of a crash may result in the owner not being able to think clearly, talk, or walk if they receive a hard enough blow to their head. It is common for cyclists to hit their heads and children do so more often. Rarely does this involve a motor vehicle.

Even if a helmet is considered an imposition or a reduction of civil liberty, the long term effect of a head and brain injury on a victim's family, carers, and society is worse. For the child or adolescent with many fulfilling years ahead of them, the event may be devastating.

The three established principles of injury prevention are education, engineering, and enforcement. Enforcement cannot happen without laws to make helmet wearing mandatory. The precedents for doing so are numerous, for example, motorcycle helmets and seat belts in cars. The current debate is similar to the one for motorbikes but differs for cars because the public regards a car essential but a bicycle or motorbike not so.

The benefits of wearing a bicycle helmet, like a seat belt, are proven. However, there is a supposed health risk due to a reduction in exercise, particularly bike riding, if helmet wearing is compulsory. This is said to reduce the health, fitness, and longevity of those discouraged from cycling. I wonder about the enthusiasm for cycling if a piece of light polystyrene on people's heads is such a deterrent.

A study reported in 1990 of a cohort of 9376 people showed they could reduce their chances of coronary artery disease and premature death by regular, lengthy, and hard exercise. However, the resulting fitness needed constant maintenance and could not be stored.

Therefore, the short term effect of any reduction in cycling caused by the laws is unlikely to translate into long term harm, because people are already remounting their bikes five years after introduction of the bicycle helmet law in Queensland. Adolescents comprise the largest number of non-wearers of helmets. They have said that, to be effective, a safety measure needs mandating, with punitive measures for non-compliance. The harm emanates from lack of enforcement rather than the laws themselves.

In 1997 nine Queenslanders died due to a bicycle incident and most of these were

children younger than 18 and all died of head injury. In my own study of 150 young people admitted to hospital following bicycle trauma, more than 50% had a head and brain injury. Cycling could be called a dangerous pastime if most of the injuries were not preventable. However, most are definitely preventable.

A well fitting, tightly fastened helmet will reduce the chance of serious head injury by 60–80%. The alleged harm inflicted by helmet laws is as yet unproven in the long term, but the benefits are evident now. The reduction in head and brain injury resulting from helmet wearing will generate financial benefits, to the health budget, as did the introduction and enforcement of car seat belt wearing.

A detailed study by colleagues and myself documented 813 children in one year in Brisbane injured in bicycle trauma. Of these, 294 hit their head and 66 sustained loss of consciousness, that is, serious head injury. The long and short term morbidity of these youngsters is a burden to be carried by society.

Why do we undertake this when mandating a safety strategy may avert the damage? None of the 66 children was wearing a helmet at the time of the incident.

In 1992, 198 cyclists in Australia died in bicycle crashes; the following three years this number fell by about 50 and increased to 161 in 1997. These annual figures would be similar from one year to the next had helmets deterred many cyclists from their ride. The risk compensation argument against helmet wearing needs critical appraisal in that helmet wearers may take more risks.

However, the contrary may also be true.

Where is the evidence? A US study has demonstrated that helmeted cyclists would have to increase their risk taking fourfold for the argument helmet wearing encourages greater risk taking to be plausible.

Thucydides, in the fifth century BC, wrote: "Justice will come [to Athens] when those who are not injured are as indignant as those who are". Some injured cyclists may not have the mental capacity following their head injury to achieve indignation. It is up to us, therefore, as health care professionals to encourage justice on their behalf.

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