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RESEARCH NOTE 17/94

**EVALUATION OF THE NSW
INTRODUCTION OF COMPULSORY
BICYCLE HELMET LEGISLATION**

Meredyth-Ann Williams

**ROADS AND TRAFFIC AUTHORITY
ROAD SAFETY AND TRAFFIC MANAGEMENT**

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Meredyth-Ann Williams

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ABSTRACT

Compulsory bicycle helmet wearing was introduced in the Australian state of New South Wales in 1991. This legislation occurred against a background of successful road safety legislative change over the last 25 years. Bicycle helmet efficacy was ascertained by monitoring community attitudes to bicycle helmet wearing, observation surveys to quantify bicyclist helmet wearing behaviour and analysis of Roads and Traffic Authority (RTA) and NSW Health statistics to detect change in bicyclist fatalities and serious injury and bicyclist head injury. Results indicate community support for compulsory bicycle helmets has been maintained, with helmet wearing rates increasing markedly since legislation and appear to be maintaining this level. In the same period, there has been a significant decrease in bicyclist head trauma.

This document is not meant to convey RTA policy. Its purpose is to inform those interested in road safety and road user strategies.

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EXECUTIVE SUMMARY

Compulsory bicycle helmet wearing was introduced in the Australian state of New South Wales in 1991. This occurred against a background of successful legislative change over the last 25 years, aimed at reducing road trauma. These changes were supported by publicity and enforcement.

Prior to the introduction of compulsory bicycle helmets, there was concern at the level of bicycle casualty, particularly fatality and serious injury rates, in which head trauma was widely implicated. In the decade prior to the introduction of legislation, annual bicyclist fatalities averaged 23, with serious injury averaging 345. The cost to the community of bicycle trauma was estimated by the STAYSAFE Committee of Inquiry (1988) to be \$100 million per annum.

The STAYSAFE Committee Report (12) was a major impetus to mandatory bicycle helmet wearing. The Committee "received compelling information about the need for helmets to be worn by bicyclists" (p.36). With other supporting information provided by many sources, the Committee recommended that helmet wearing be made compulsory.

With supporting recommendations from three other reports, the Roads and Traffic Authority (RTA) convened committees of stakeholders in 1989/1990 to progress consultation and implementation arrangements for bicycle helmet legislation, to oversee the transition of the legislation and to co-ordinate activities, programs and directions related to bicycle safety.

Compulsory bicycle helmet wearing was supported by, among others, the medical profession, the Bicycle Institute of NSW and the RTA's Bicycle Advisory Council. However, the feeling of many individuals in the bicycling fraternity was anti-helmet and particularly anti-compulsory legislation.

Legislation was introduced 1 January 1991 for bicyclists 16 years and over and for all bicyclists on 1 July 1991. Exemptions to helmet wearing were granted on medical and religious grounds, and for overseas bicyclists attending races. All exemptions were removed 1 January, 1992.

The bicycle helmet campaign was conducted in two parts, to correspond to the two-stage introduction of the legislation. The theme concentrated on the safety benefits of wearing helmets, with information and promotion activities conducted throughout NSW including packages in non-english speaking background (NESB) community languages.

The public attitude to bicycle helmet wearing was tested pre-legislation, during legislation introduction and post-legislation. The benefits of wearing a helmet were widely recognised and convincing to the community. However, although there was wide recognition, pre-legislation, of the benefits of helmet wearing (>86%), over 80% of riders indicated they never wore a helmet.

Bicycle helmet wearing rates were determined by observation surveys conducted 1990-1993 inclusively. The overall wearing rate rose for child riders, less than 16 years, from 12%, pre-legislation (1990), to 74%, post-legislation (1993). Adult helmet wearing over the same period has risen from 26% to 83%. In general, the surveys indicated that helmet wearing was lower in Sydney than the rest of NSW, lower for child riders than adult riders, lower for male riders than female riders and lower for secondary school students than primary school students.

In the last two observation surveys, quality of helmet wearing was also noted, as much of the potential benefit of wearing a bicycle helmet can be lost if the helmet is not positioned and fastened correctly. Correct helmet wearing was very low. In 1993, only 53% of those bicyclists observed wearing helmets wore them correctly. In general, the quality of helmet wearing mirrors the wearing rate scenario.

From 1990-1993, there was a decrease in bicyclist fatalities of 60% and serious injury of 21%. Child bicyclist fatalities fell (57%) as did child bicyclist serious injury (26%). A similar picture is seen for adult bicyclists, with fatalities falling 62% and serious injury falling 21%. However, as bicyclist fatalities are few in number, statistical results are vulnerable to random fluctuation and should be interpreted with caution. Also, these results should be seen in light of the total drop in NSW road casualties over the same period.

According to the 1992/93 NSW Health Department statistics, the majority of bicyclist trauma involves the 5-19 years age group which accounted for 67% of bicyclist hospital separations¹. Although bicyclist trauma does not predominantly occur through motor vehicle accidents (MVAs), this type of accident generally involves greater severity of trauma. In 1992/93, MVAs accounted for only 10% of child bicyclist separations and 24% of adult bicyclist separations. Dr Victor Carey (1991) indicated that of the child bicyclists presenting to Sydney hospitals who had not been involved in an MVA, 73% had lost control of their bicycle.

Head trauma has been implicated as the most common cause of death and serious disability in bicycle accidents (Thompson *et al*, 1989). Amongst seriously injured

¹ A separation is the basic unit of measurement of the NSW Health Department. A patient may incur a separation if they are discharged and/or transferred to another hospital and/or die. Thus a patient may be counted for more than one separation. Separation results provide a trend indication rather than addressing actual numbers of patients involved in bicyclist trauma and cannot be compared to Police/RTA data.

bicyclists, head injuries are common. It would be expected that if helmets were a successful safety device, head injuries would decrease with increases in helmet wearing. Based on NSW Health Department statistics, there was a significant decrease in hospital separations for bicyclist head injuries from 1988/89 to 1992/93. In that time, child bicyclist separations have fallen 34%, with adult bicyclist separations falling 29%. Injuries, other than head injuries, accounted for 70% of both adult and child bicyclist separations in 1992/93. In a site-specific study conducted in Coffs Harbour, both before (Beattie, 1991) and after (Beattie, 1994) the introduction of bicycle helmet legislation, Beattie (1994) indicated that the number of child bicyclists being admitted for head injury fell significantly ($p < 0.001$) from pre to post legislation, as did adult bicyclist head injury cases ($p < 0.05$). Thus, according to NSW Health statistics, there appears to be an inverse relationship between bicycle helmet wearing and bicyclist head injury.

From the point of the three aims of the bicycle helmet legislation, (i) to increase helmet wearing, (ii) to decrease bicyclist fatality and serious injury, and (iii) to decrease head trauma, the legislation has been effective. All three were achieved. The success of these aims was in line with those of the RTA and has had a large economic impact on the NSW community, both in human and financial terms.

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1 INTRODUCTION

There has been, in NSW, a history of successful legislative change aimed at modifying behaviour in order to reduce road trauma. These changes, which have been instigated over the last 25 years, supported by publicity and enforcement, have included :

Motorcycles

In August 1971, compulsory helmet wearing for motorcyclist and pillion passenger were introduced

Occupant restraints

On 1 October 1971, there was compulsory wearing of fitted seat belts. In March 1977, legislation was effected for compulsory restraint wearing of a child under 8 years, if the restraint was available, and this was followed 11 years later with compulsory restraints to be fitted in vehicles for children 12 months or younger.

The 1993 observed wearing rates for adult occupants was 95% and child (< 14 years) occupants was 89%.

Drink-driving

In December 1980, the prescribed concentration of alcohol (PCA) was reduced from 0.08 to 0.05. There has been an estimated 10% reduction in drink-driving accidents since this change. On 17 December 1982, random breath testing (RBT) was introduced and since that time there has been an estimated 20% reduction in drink-driving accidents.

Prior to the introduction of compulsory bicycle helmets, there was concern at the level of bicycle casualty, particularly fatality and serious injury rates, in which head trauma was widely implicated. Research indicated that bicycle helmets had the propensity to reduce the risk of head injury and brain injury by over 85% and the medical fraternity was very supportive of helmet legislation, as they could see the health benefit of such a move.

There were mixed feelings in the broader community concerning compulsory helmet wearing. Many individuals in the bicycling community, as exemplified in cycling magazines, were not in favour of this legislation, citing freedom of choice and proficient riding ability as arguments for non-implementation of the legislation. However, the State bicycle users association, the Bicycle Institute of NSW (now Bicycle NSW) was support-

ive of the legislation. In a survey conducted for the Roads and Traffic Authority (RTA) in 1989, the general feeling of the community was one of approval regarding compulsory bicycle helmets. In the same survey, the respondents were also convinced of the life-saving property of bicycle helmets and their ability to prevent head injuries.

In 1990, the Minister for Roads indicated the government's commitment to compulsory helmet wearing and announced that helmet wearing would become compulsory for riders 16 years and older on 1 January 1991 and for all riders on 1 July 1991. The staggered introduction was considered appropriate as it provided an adult role model before the July legislation introduction, which included riders younger than 16 years, and the cost of helmet purchase would be defrayed across six months for bicycle riding families.

This legislation aimed to :

- increase the wearing of bicycle helmets
- reduce bicyclist fatality and serious injury rate
- reduce head trauma sustained by bicyclists

This report describes the process of introduction of the legislation and attempts to trace the effects of the legislative change and related activity on behaviour, attitudes and injury to bicyclists, that is, the extent to which the objectives were met.

2 BICYCLE PRE-HELMET LEGISLATION

2.1. CASUALTIES

2.2. COST TO THE COMMUNITY

2.3. IMPETUS TO LEGISLATION

2.3.1. House of Representatives Standing Committee Report (1978 & 1985)

2.3.2. The Victorian Experience

2.3.3. The NSW Experience

2.3.3.1. Rebate Schemes

2.3.3.1.1. RTA (1986 & 1988)

2.3.3.1.2. RTA/CAPFA/Lions (1991)

2.3.3.2. ABS Report (1988)

2.3.3.3. STAYSAFE 12 (1988)

2.3.3.4. Report by George Paciullo (1989)

2.3.3.5. Bicycle Helmet Taskforces (1989-1990)

2.3.3.6. Bicycle Safety Task Group (1990)

2.3.3.7. Medical Perspective

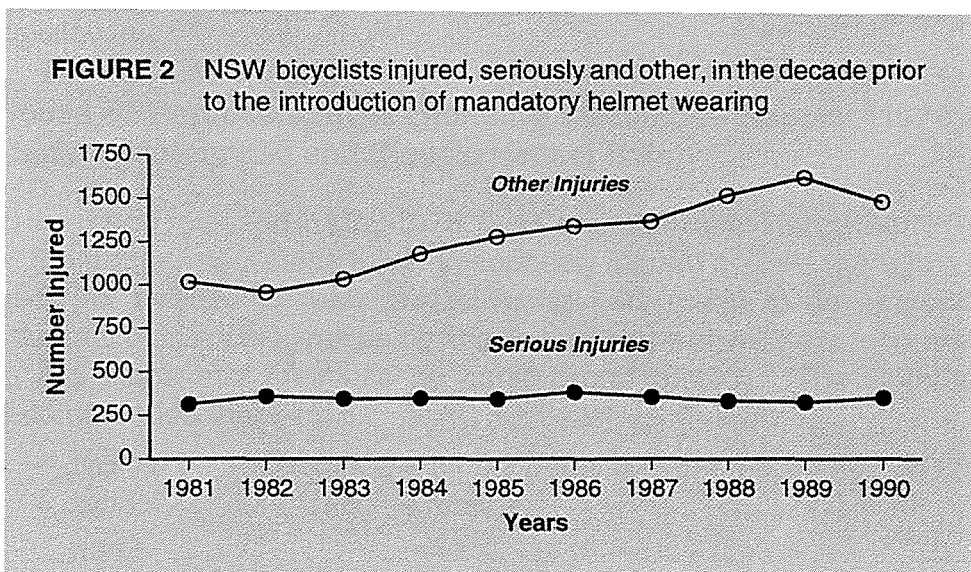
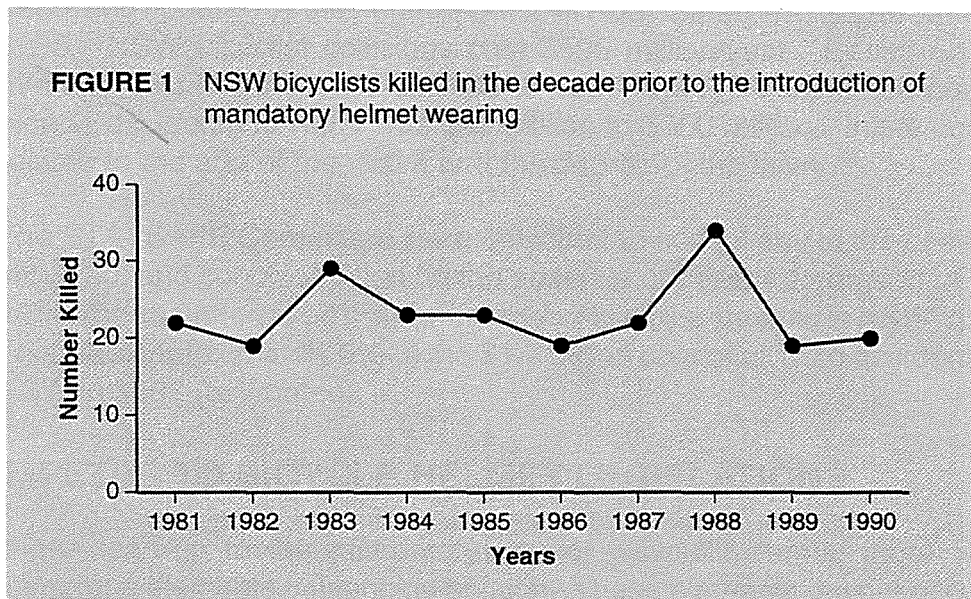
2.3.3.8. Cycling Perspective

2.3.3.9. Bicycle helmet legislation foreshadowed

2.1 CASUALTIES

Bicyclist casualty is under-reported, as a large number of accidents are bicycle-alone and therefore may not be reported to the Police or admitted to hospital. Thus, the casualty information does not find its way onto any database. The RTA database, whose foundation is Police information, is likely to account for the most severe bicyclist trauma. Data used throughout this document are up to and including 1993 figures as 1994 figures were unavailable at time of writing.

Based on RTA statistics, in the 10 years prior to the introduction of bicycle helmets, fatalities were on average 23 per annum, reaching a high in 1988 of 34 (Figure 1). Figure 2 evidences that the number of bicyclists suffering



serious injury i.e., those requiring hospital admission, rose from 316 in 1981 to 349 in 1990, with the highest serious injury (381) occurring in 1986. The average number of bicyclists per year who suffered serious injury in this 10 year period was 345. Other injuries to bicyclists i.e., those not involved in hospital admission, also rose in this period, from 956 to 1511, with the highest other injury (1617) occurring in 1988. On average, 1428 bicycle riders annually sustained non-serious injuries from 1981 to 1990.

2.2. COST TO THE COMMUNITY

At the time of the STAYSAFE Committee's Inquiry into Bicycle Safety in 1988, there were numerous estimates of the casualty costs of bicycle accidents. On the basis of average cost of casualties, which was issued by the Federal Bureau of Transport and Communication Economics in 1985, and updated by the Federal Office of Road Safety (FORS) to January 1988, NSW bicyclist collisions cost \$596 million/year. Based on the average casualty statistics of 1985 to 1987, the RTA estimated cost of bicycle accidents to NSW was \$41 million to \$300 million. Injury cost is related to the age of the victim and the degree of the injury.

The STAYSAFE Committee were reluctant to accept any of the costings provided, and concluded that "in the absence of better information...\$100 million be assumed to be the annual cost of bicyclist crashes in NSW" (p.7). This was approximately 6% of the \$1.7 billion cost of all road accidents in NSW in 1987 (estimated).

2.3. IMPETUS TO BICYCLE HELMET LEGISLATION

In the lead-up to the mandatory use of bicycle helmets, there were numerous elements influencing opinion. These elements did not occur in isolation but intermeshed, providing the structure and momentum to legislation.

2.3.1. House of Representatives Standing Committee Report (1978 and 1985) - Motorcycle and Bicycle Helmet Safety

In the report released in May 1978, this Committee considered that "in view of the frequency of head injury in seriously injured cyclists there is a real need for cyclists to wear protective helmets made to an appropriate standard but...for the time being [the committee] is unwilling to recommend at this stage that their use be compulsory" (p.103). The Committee recommended that :

- *cyclists be advised of the safety benefits of protective helmets by publicity or other suitable means*
and

- *the possibility of requiring cyclists to wear helmets be kept under review (p103)*

A final report was released in November 1985. This particular inquiry began in 1984 under the auspices of the Road Safety Committee but was dissolved before being able to complete its inquiry into bicycle helmets. Subsequently, the Transport Safety Committee was given the brief to continue the investigation with broader terms of reference. The Committee expressed concern at the over-representation of children in bicycle fatality and injury statistics. FORS estimated that 70% of all bicycle casualties involved children aged between 7-17 years but that this age group only made up 18.4% of the population in 1984. The Committee also expressed concern at the apparent general under-reporting of bicycle accidents.

With such a large variety of helmets on the market, the Committee was also concerned that consumers needed education and appropriate guidance in their choice of suitable, quality helmets. They recommended that rebate schemes be instigated in conjunction with a national program to encourage schools to implement compulsory wearing of helmets by students, when riding to and from school. The Committee also considered that the financial benefit to the individual and the community did, in the final analysis, warrant compulsory helmet legislation as a desirable object.

2.3.2. Victorian Experience

The State of Victoria had been attempting to increase bicycle helmet wearing from the early 1980s. Within the school system, support developed around the Bike-Ed program, a bicycle safety education program, which was devised for primary children (9-13 years), and began operating in 1980. This promoted helmet wearing and safe riding. In 1982, a pilot scheme for bulk helmets to be sold through schools at a 33% discount was initiated, and with all the underwritten helmets sold, it demonstrated that demand for helmets could be generated by such discount schemes. Over the next two years other rebate schemes were initiated, with at least 20,000 helmets purchased (Vulcan *et al*, 1992). From 1983, the Department of Education required a helmet to be worn in all state school bicycling activities. The Victorian Road Traffic Authority also sponsored helmet rebate schemes in 1984-89 inclusive, usually involving a \$10 rebate. Over this time there were more than 168,000 helmet rebates from all schemes (Leicester *et al*, 1991). Mass media campaigns began in 1984 and continued until 1990, the year of mandatory bicycle helmet legislation. Bicycle helmet wearing surveys were introduced in 1983 and continued annually until 1991. Table 1 indicates the observed helmet wearing rates in Victoria, at three points, both prior to and post mandatory helmet wearing, from the time of the first survey until November, 1990.

TABLE 1 Victorian bicycle helmet wearing rates, pre-legislation (1983 and March 1990) and post-legislation (Nov, 1990) (after Leicester *et al*, 1991).

	VICTORIAN BICYCLE HELMET WEARING RATE (%)							
	Primary School		Secondary School		Adult Commuter		Adult Recreation	
	Metro	Rural	Metro	Rural	Metro	Rural	Metro	Rural
1983	4.6	30.5 ^a	1.6	5.4	26	9	8.0 ^b	13.0 ^b
MAR 1990	76.8	58.2	18.4	20.2	46.2	14.4	32.7	10
NOV 1990	93.7	89.3	64.2	65.1	91.5	69.3	59.4	69.6

a) 1985 first survey
b) 1987 first survey

In September, 1989, the Minister for Transport and the Minister for Police and Emergency Services had announced, as part of a package of road safety initiatives, that mandatory bicycle helmet wearing would become law in Victoria on 1 July, 1990.

Hence, Victoria had an early focus on bicycle planning, bicyclist education and helmet wearing and was the first Australian state to introduce mandatory wearing of bicycle helmets, six months earlier than NSW.

2.3.3. NSW Experience

2.3.3.1. Rebate Schemes

2.3.3.1.1. RTA (1986 and 1988)

The RTA conducted two bicycle helmet rebate schemes, following the Victorian example, to encourage the purchase and wearing of bicycle helmets, the first in December 1986 and a subsequent scheme in February-May 1988. The use of subsidy schemes is designed to encourage safety behaviours by decreasing the financial penalty which may be associated with the preferred practice. Neither scheme was accompanied by the level of helmet safety and rebate scheme publicity that that was used in Victoria. The initial NSW scheme was not a success. Difficulties were encountered with (i) the centralised administration of the rebate causing delays in processing, (ii) the rebate of \$5 (10%) was considered too low to motivate people to claim the rebate and thus the funding allocated for the scheme was not fully subscribed, and (iii) the time period for this scheme, although taking advantage of the Christmas buying period, was too short (three weeks) The greater success of the second campaign was seen as a result of the amount of the rebate (\$12 i.e., 25% discount), the

implementation of the scheme (delegation of responsibility to community groups and schools) and the timing of the scheme (longer time 3-4 months). Although the latter scheme provided for the sale of more than 15,000 helmets, a post-rebate observational survey of participating schools indicated that helmet wearing had not increased.

2.3.3.1.2. RTA/CAPFA/Lions

The Child Accident Prevention Foundation of Australia (CAPFA, now known as Kidsafe) and the Lions Club of NSW have had a long relationship focusing on bicycle helmet safety since 1988 and they promoted several schemes to increase child bicycle helmet wearing, including a bicycle helmet sponsorship/rebate scheme with the RTA in 1989. In 1991, CAPFA and Lions initiated a joint helmet promotion to coincide with the 1 July legislation introduction, which was supported by the RTA. District Lions Clubs participated on three levels. All Clubs were issued with the special RTA information kits which were launched on 12 June and used them to promote bicycle safety (see 3.5.2.). Some clubs took this a step further, and provided subsidised bicycle helmets for children, while others provided free helmets to child bicyclists. The approach each club took was of their own choosing, and those supplying helmets administered their own scheme.

2.3.3.2. Australian Bureau of Statistics Report (October, 1988)- Bicycle Usage and Safety

This survey was conducted at the request of the RTA State Bicycle Committee, now the Bicycle Advisory Council. The Australian Bureau of Statistics (ABS) report considered that there was "a need for reliable data on cycling accidents...so that safety and educational programs can be targeted to those at most risk"(p.2). Other uses of the results of this survey were considered to be for improved planning, implementation and assessment of safety programs, facilities, enforcement programs and school and community educational programs. The report provided a statistical picture of bicycling ownership and behaviour in NSW. The survey indicated that 37% of the population, over five years of age, rode bicycles. Less than 15% of regular bicyclists usually wore a helmet, with 17% never wearing a bicycle helmet. It was considered that there was substantial under-reporting of accidents to the police. Of all the bicyclists who had an accident in the previous 12 months (>127,000), 63% were aged between 5-14 years. In the 5-9 years age group, 54% of bicyclists who had had an accident, had more than one accident in the last 12 months.

This report helped to focus attention on the problem of bicyclist accidents and the need to promote helmet wearing.

2.3.3.3. Parliament of New South Wales Joint Standing Committee on Road Safety - Bicycle Safety (October, 1988) - STAYSAFE 12

The STAYSAFE Committee was established in 1982, following concerns expressed by Members of both Houses of the NSW Parliament at the state's road toll. This was the first Joint Standing Committee ever appointed in the NSW Parliament. The ongoing task for the new Committee was to :

- (a) *monitor, investigate and report on the road safety situation in New South Wales; and*
- (b) *review and report on countermeasures aimed at reducing deaths, injuries, and the social and economic costs to the community arising from road accidents. (p.8, STAYSAFE 23,1992)*

In STAYSAFE 12 (1988) there was a particular concern "that the number of bicycle fatalities [were] increasing, and that the substantial magnitude of the bicyclist injury problem had been grossly underestimated by the authorities responsible for bicyclist safety." (p.viii). After investigation, the Committee recommended that "widespread wearing of helmets should not be delayed (p.38)...and that priority at this time be on getting...helmets accepted" (p.39). The Committee also considered that "widespread wearing is practical" (p.41) and "that firmly enforced requirements to use safety equipment can have great benefits in reducing casualties" (p.41). "The Committee [was] of the opinion that the loss of freedom to decide [to wear or not to wear helmets], would be outweighed by the release of all citizens from the burdensome shared cost of serious head injuries" (p.42). In Recommendation 6.1 (e), the Committee stated that the RTA "submit firm plans, in regard to compulsory helmet wearing" (p.45).

2.3.3.4. Report on Bicycle Helmet Promotion in NSW and Related Bicycle Safety Issues (1989) - Report by George Paciuillo

This report was researched and prepared by George Paciuillo. Mr Paciuillo had been the first Chairman of the STAYSAFE Joint Parliamentary Standing Committee on Road Safety (1982) while a Minister in the Labor Government of NSW. After leaving Parliament, Mr Paciuillo was retained by the RTA to prepare this report. Specifically, Mr Paciuillo was commissioned to :

- (i) *appreciate the progress of the RTA/CAPFA/Lions Clubs [in their bicycle helmet sponsorship/rebate scheme] and what arrangements might be made to maximise their results.*
- (ii) *suggest what might be done to achieve current [bicycle helmet] wearing rates sufficiently high to support compulsory wearing*
- (iii) *evaluate what additional progress might be achieved from incorporating lessons learned from experience elsewhere, notably Victoria*

and Western Australia (p.3. Paciuillo report, 1989)

This strongly worded report stated that "the wearing of an effective helmet gives its user vital protection against serious head injury...and [can] potentially halve the number of cyclist deaths caused by head injuries (which are the cause of four out of five bicycle fatalities)" (p.7). Mr Paciuillo considered that the evidence was clear that if all bicyclists effectively wore a helmet, there would be "an immediate and dramatic drop in accident trauma" (p.12). He went further, implying there was no good reason "why it should not be required by law for a cyclist to be helmeted whenever using a public thoroughfare" (p12), i.e., wearing should be compulsory. Mr Paciuillo suggested that the implementation of compulsory helmet wearing should be staggered, with those riders older than 18 years having to comply first and thus provide a role-model to those younger, whose mandatory legislation should come into force three months later. No exemptions should be considered, "if a cyclist is not fit enough to wear a helmet, he or she is not fit enough to ride a bike" (p.16). Mr Paciuillo also made some suggestions as to changes to the Australian Standard for helmet design and performance which should precede legislation.

2.3.3.5. **Bicycle Helmet Taskforces (1989-1990)**

Following on from the recommendations for compulsory helmets by, particularly STAYSAFE, and supported by the report by George Paciuillo suggesting broad implementation details, the **Bicycle Helmet Taskforce** was convened on 17 August, 1989. The aim of the taskforce was to progress consultation and implementation arrangements for the introduction of compulsory bicycle helmet legislation, and consisted of representatives from the Road Safety Bureau, Police Service, Department of School Education, Royal Australian College of Surgeons, Newcastle Cycleways Movement and the Bicycle Institute of NSW, and later included a member of the Catholic Education Commission. The taskforce was chaired by George Paciuillo. The terms of reference of this taskforce were to :

1. *oversee the development of strategies to introduce compulsory wearing of bicycle helmets*
2. *co-ordinate those organisations working to introduce compulsory helmet wearing*
3. *provide a forum for Government, bicycle user organisations and other relevant groups to consider compulsory helmet wearing and related issues (p.1, Taskforce Report, 1990)*

The taskforce report, produced in 1990, saw compulsory helmet wearing as having great potential to save lives, and proposed that this measure should be part of a total package for bicyclists which would include :

- *improved enforcement against errant cyclists and motorists*

- *improved provision for cyclists on roads and through special facilities*
- *continuing and additional education of cyclists and motorists (p.1)*

The taskforce prepared an implementation plan which outlined the proposed schedule for compulsory helmet wearing. The stages included the announcement of forthcoming legislation, supported by advertising throughout 1990-1991, ensuring a suitable standard for helmet manufacture and helmet availability, both size and quantity, and appropriate enforcement.

This taskforce was succeeded by the **Bicycle Helmet Wearing Implementation Taskforce** which was convened on 20 June, 1990, and consisted of representatives of the Road Safety Bureau, Bicycle Advisory Council, other RTA delegates and the Department of Transport. The brief of the wearing implementation taskforce was to oversee the transition of the legislation into the public arena.

2.3.3.6. Bicycle Safety Task Group

The objective of this group, convened in August 1990, was to manage the broader bicycle program which included co-ordination of activities, programs and directions related to bicycle safety. Members of this group were from the Road Safety Bureau, Bicycle Advisory Council, RTA Regions and the NSW Police Service. This Committee also acted as the reference group for the advertising and public relation campaigns conducted by the RTA.

2.3.3.7. Medical Perspective

There was much support for the introduction of bicycle helmets from the medical profession. The Royal Australian College of Surgeons was supportive of the legislation, as were doctors involved in pædiatrics who were particularly interested in trauma to child and adolescent bicyclists, as their own experiences and medical research, e.g., Thompson *et al*, (1990), suggested that the majority of bicycle accident head injuries occur in this age group. Thompson *et al* (1989) also indicated that bicycle helmets had the potential to reduce the risk of head injury by 85% and brain injury by 88%.

2.3.3.8. Cycling Perspective

On examination of bicycling magazines at the time of legislation, the feeling of many individuals in the Australian bicycle fraternity was anti-helmet and particularly, against compulsory legislation. There was, however, the occasional pro-helmet advocate.

The magazine editorial approach tended to be antagonistic toward compulsory helmet legislation, but some, e.g., *Bicycle Victoria*, encouraged helmet wearing. Articles within the body of the magazines, although primarily against the idea of bicycle helmet legislation, did provide a more balanced perspective on the topic. Bicycle user groups throughout Australia supported helmet usage, although there were some concerns with helmet design, e.g., in the Northern Territory, the lack of air flow through helmets was of particular concern. The RTA's Bicycle Advisory Council also supported the legislation. The NSW Cycling Federation required helmets to be worn for all track and road events from 10 October, 1990.

2.3.3.9. Bicycle helmet legislation foreshadowed

The Minister for Roads stated on 28 March, 1990, the government's commitment to compulsory bicycle helmet wearing. The Minister indicated that compulsory bicycle helmet wearing would be introduced for riders 16 years or older on 1 January, 1991, and for all bicycle riders on 1 July, 1991.

A staggered introduction was a useful procedure as it:

- (i) provided children with a role model and
- (ii) would defray the cost of helmet purchase for families across six months

3 BICYCLE HELMET LEGISLATION INTRODUCTION

3.1. LEGISLATIVE CHANGE

3.2. AUSTRALIAN STANDARDS FOR HELMETS

3.3. POLICE INVOLVEMENT

3.3.1. Enforcement

3.3.2. Reinforcement

3.4. ISSUES RAISED DURING LEGISLATION INTRODUCTION

3.4.1. Bicyclists with larger head sizes

3.4.2. Sikh religious considerations

3.4.3. Bicycle hire organisations

3.4.4. Business operators of Lord Howe Island

3.4.5. Sun protection

3.4.5.1. Australia Post

3.4.5.2. Bicyclists

3.4.6. School pupil helmet identification

3.4.7. Financially disadvantaged

3.4.8. Summary

3.5. PROMOTIONAL CAMPAIGN

3.5.1. Phase I

3.5.2. Phase II

3.5.3. Tracking results of the campaign message

3.1. LEGISLATIVE CHANGE

The law was amended to include the compulsory wearing of a protective helmet, approved by the NSW Roads and Traffic Authority, from 1 January 1991 for persons, rider and/or passenger, 16 years and above and 1 July 1991 for all persons riding on a bicycle in a public street, where 'public street' is any place open to or used by the public. Helmets approved by the Authority are those which have passed the current Australian Standard pertaining to bicycle helmets.

Helmet wearing exemptions were granted on medical grounds, in religious consideration for Sikhs who wore turbans, and for overseas visitors attending bicycle races. Exemptions were valid until 1 January, 1992, after which all exemptions were removed.

3.2. HELMET STANDARD

The Australian Standard AS 2063 (1977) relating to lightweight protective helmets (for the use of pedal cycling, horse riding and other activities requiring similar protection) was particularised in 1986 to address bicyclists. The bicycle version of the standard became AS 2063.1. This standard required bicycle helmets to have a hard shell, a means of absorbing impact energy, a retention system, to be resistant to penetration and have ventilation openings through which a 20mm diameter rod could not pass. This standard provided helmets which were considered heavy and hot by bicyclists and were not particularly popular.

With the advent of mandatory legislation, the discomfort of the bicycle helmet was investigated. To a large extent, the undesirable features of the Standards Approved helmets were due to the requirement to pass a test evidencing resistance to penetration by a spike-shaped object. Given the low likelihood of such impacts in real world accidents, it was considered appropriate to replace this test with one involving impact with an angled anvil, simulating more expected impacts in accidents. With the test for resistance to penetration standard removed, it was possible to improve ventilation and reduce weight. This modification allowed for soft shell helmets, with ventilation openings which were not size-restricted. However, it was still necessary for the helmet to pass the impact energy attenuation requirement, a test of the protective capacity of the helmet. This test requires that a helmet, strapped to a metal headform representing a human head in shape and weight, be able to withstand being dropped one metre in guided free-fall onto a steel anvil.

The Australian Standard AS 2063.1 (1986) was amended in 1990 to incorporate the above changes and became AS 2063.2.

From October, 1990, those helmets which were not certified to the Australian Standard were banned from sale. Thus, at the time of the introduction of the legislation, only Standards Approved helmets were available. Those riders who own a helmet which complies with the 1986 Australian Standard (AS2063.1) may continue wearing the helmet until 1 January, 1996. Subsequent to this time, all bicyclists will be required to use a helmet certified to the 1990 Australian Standard (AS2063.2).

The Australian Standard AS 2063.1 (1986) became invalid 8 April 1992. Australian Standard AS 2063.2 is now the only valid standard for bicycle helmets.

3.3. POLICE INVOLVEMENT

3.3.1. Enforcement

In the month subsequent to the introduction of mandatory helmet wearing on 1 January, 1991, the NSW Police Service educated and encouraged the bicycling public regarding helmet wearing, easing bicyclists into enforcement of the legislation. However, on the first weekend in February, 1991, beginning at 1pm on Friday 1st, the Police Service conducted a state-wide operation, "Ride Safe", which targeted bicycle offences, including the new helmet legislation. The objectives of this operation were to :

- *raise awareness amongst cyclists, particularly older than 16 years, of their obligation to comply with road rules and bicyclist regulations*
- *demonstrate that Police were enforcing rules and regulations pertaining to bicyclists*

TABLE 2 Most frequent bicycle infringements for which notices were issued by the NSW Police Service 1991-1993. These four infringements account for 87%-94% of bicycle infringement notices issued. The total number of infringement categories is 23 (NSW Police Service, 1994).

	BICYCLE INFRINGEMENTS		
	1991	1992	1993
Total infringements	10677	19705	17996
No helmet	5853	15281	14072
No front light	1605	1500	1271
No tail light	980	884	768
Riding on the footpath	883	799	182

This was a relatively "low-key" operation. However, over this weekend there were 1499 cautions given to bicyclists, 803 for no helmet and 696 for other infringements. Of those infringements issued, the majority were for non-helmet wearing (609), riding on the footpath (87), no front light (89) and no rear light (64). It was anticipated, however, that after the initial campaign/s to establish helmet wearing, minimal enforcement would be required to sustain a high level of helmet wearing. The current bicyclist helmet infringement process is that bicycle riders 15 years or older are fined for non-compliance, while children 10-14 are given a caution, preferably with their parent/s or carer/s present.

Table 2 indicates traffic infringement notices given to bicyclists post helmet legislation (1991-1993).

3.3.2. Reinforcement

A number of supporting activities were initiated by the Police to reinforce helmet wearing. Beat police from Paddington, for instance, conducted two bicycle education days at the children's bicycle track at Centennial Park on Sunday 23 & 30 June 1991. Among other activities, the Police carried out safety checks, bicycle engraving to prevent theft and bicycle helmet adjustment.

Cronulla police instigated a "Stop, Playsafe, Ridesafe, Staysafe" day on 27 June 1991, at which bicycle safety checks were also conducted.

3.4. ISSUES RAISED DURING LEGISLATION INTRODUCTION

As Victoria preceded NSW in the introduction of compulsory bicycle helmet legislation, VicRoads provided insight into likely difficulties, e.g., exemptions, rebate schemes, and also provided support to the RTA during legislation introduction.

The following issues arose during the introduction of NSW legislation :

3.4.1. Bicyclists with larger head sizes

Helmet manufacturers initially only produced helmet sizes up to 62/63 cms. However, after requests for larger sizes, several firms produced sizes 64-66 cms. Throughout the legislation transition, bicycle helmet manufacturers provided great support to the RTA, and many were prepared to manufacture helmets to fit non-standard sized heads, although this may not have been financially viable.

3.4.2. Sikh religious considerations

The male Sikh requirement for covering the head with a turban made helmet wearing impossible. Male Sikh bicyclists were absolved from helmet wearing for the exemption period while helmet manufacturers investigated the possibility of producing a Standards Approved helmet for Sikhs. However, a suitable helmet could not be produced and the Sikh exemption, as did all exemptions, expired on 1 January 1992.

3.4.3. Bicycle hire organisations

One of the concerns of these organisations was the initial outlay for bicycle helmets to satisfy the regulations, which some operators perceived would make their business unviable. However, no exemption was provided in the case of these tourist and leisure organisations. These organisations were also concerned as to the hygiene aspect of numerous people wearing the one helmet, but replaceable sizing pads were available which provided an appropriate solution. There was also a health concern that head lice could be passed via hire helmets. However, medical advice indicated that it was unlikely that head lice would be passed in this way.

3.4.4. Business operators of Lord Howe Island

Several business operators of Lord Howe Island considered that the introduction of mandatory bicycle helmets would not only decrease tourism, as the pleasure of riding the island would be diminished, but would also decrease the use of bicycle transport on the island, and thereby increase the use of vehicular traffic. However, no exemption was granted.

3.4.5. Sun protection

3.4.5.1. Australia Post

The Postal Delivery Officer (PDO) Union objected to the compulsory wearing of bicycle helmets as they considered helmets would involve excessive exposure to the sun, and their members had been issued with broad-brimmed hats as a means of sun-protection. Victoria had granted an exemption to bicycle PDOs. An appropriate sun visor and neck flap were developed in conjunction with the NSW Cancer Council, to provide suitable protection to the PDOs while wearing their bicycle helmet. After a three month trial, helmets became standard apparel for bicycle delivery personnel.

3.4.5.2. Bicyclists

Sun protection was a concern to many riders, as Australia has the highest

skin cancer rate in the world, and riding with wide-brimmed hats as a form of skin protection was no longer an option. Again, there was much helmet manufacturer support of this issue, and attachable neck flaps and sun visors were designed. Also a legionnaire-style cap was produced for use with bicycle helmets.

3.4.6. School pupil helmet identification

Schools expressed a difficulty with identifying possession of bicycle helmets. As solvent-based markers damaged the integrity of the outer shell, and proved unsuitable for many inner shells, it was suggested that name tags be stitched onto helmet straps.

3.4.7. Financially disadvantaged

The RTA investigated the cost of helmet purchase, and following extensive discussions with VicRoads, decided not to introduce a direct marketing strategy or a bulk purchasing scheme, as the important factor of proper fit of the helmet could not be adequately addressed in these cases. The RTA also investigated the possibility of introducing a rebate scheme, but this was not considered to be cost-effective. The RTA liaised closely with helmet manufacturers, distributors and retailers, and a large number of these companies assisted the RTA by generously donating helmets for impecunious bicycle riders.

3.4.8. Summary

Generally, issues raised by the community were addressed, except the issue of helmet wearing for Sikhs, as the manufacturers considered it was unlikely they could develop a helmet which passed the Australian Standard for bicycle helmets. Other objections were raised by bicyclists over the perceived loss of freedom to choose helmet wearing, and their perceived riding capability or area of riding not warranting helmet wearing. However, the individual and community benefit gained by decreased fatality/serious injury was considered to outweigh these individual objections.

3.5. PROMOTIONAL CAMPAIGN

The objectives for this campaign, as reiterated in the "Specification for Media Advertising and Public Relations" (NSW RTA, 1991) of the helmet campaign were:

In the short-term to :

- *remind the public of the compulsory helmet wearing requirement*
- *advise people how to get maximum benefit from wearing a helmet,*

*including the need to wear the helmet properly
[the need to] fasten the strap
[the fact that] tampering with helmets can have detrimental effect on the performance of the helmet*

The long-term objective was to :

- *achieve widespread acceptance of the safety benefits of properly wearing and caring for a bicycle helmet*

The bicycle helmet campaign was run in conjunction with promotions on bicycle compliance with road rules and attitudes of drivers to bicyclists. This approach was in response to the need, identified by bicyclist groups, to address "primary safety", i.e., avoidance of accidents, as well as increasing helmet use, a "secondary safety" measure, to reduce the level of injury from accidents.

The campaign was conducted in two phases, to correspond to the two-stage introduction of the legislation and cost approximately \$2.5 million. The theme concentrated on the safety benefits of wearing helmets and the campaign slogan was, "If you don't need a head, You don't need a helmet".

3.5.1. Phase I - Lead up to Compulsory Helmet Wearing for Adults

The Minister for Roads launched the campaign on 9 December 1990. This launch aimed to raise public awareness of the social and economic necessity for bicycle riders to wear helmets and to impress upon all bicycle riders the considerable risk they take when riding without a helmet.

Promotion included

- advertising :
 - television
 - 1 the helmet test rig showing a falling helmet with a voice-over indicating unexpected events which could cause accidents while bicycle riding e.g., a dog running out, which addressed the misperception that experienced riders didn't need helmets
 - 2 the use of helmets in a variety of sports e.g., motor bike riding, motor car racing, canoeing and bicycling, to build on the acceptance of helmets in other sports
 - cinema the helmet test rig, as described above
- magazine, newspaper and radio advertising
- press releases to metropolitan and rural newspapers
- information kits

- brochure and poster publication
- win-a-bike competition in the Sun Herald December 1990
- handlebar stickers supporting the campaign slogan to remind bicycle buyers about helmets
- promotional activities at the Teddy Bears picnic in November, 1990
- monocyclist "Ivor Helmet" who performed at local shopping centres to promote the bicycle helmet message
- ABC radio bicycle safety slogan competition
- McDonalds Restaurant tray mats with bicycle safety themes

3.5.2. Phase II - Lead up to Compulsory Helmet Wearing for Children

Launched 12 June 1991, by Minister for Roads, and simultaneously in all RTA regions. This phase consisted of an advertising campaign with supporting public relations, complemented by a school-based project run by the RTA regions, School Education Unit, Department of School Education and the Catholic Education Office.

Special information kits produced as a resource for teachers (K-Y12) and the community, and designed to integrate with existing road safety teaching materials, were distributed to every primary and secondary school in the State. This package was aimed at increasing the awareness of students and the community of the need to wear helmets when riding, and included information sheets, classroom activities and a poster. They were endorsed by the Child Accident Prevention Foundation of Australia, and were developed by the RTA in conjunction with the Department of School Education and the Catholic Education Office.

Other advertising materials included brochures and posters, bookmarks, stickers, t-shirts and refrigerator magnets, head measuring tapes, pencils and notepads. Advertising was also conducted in magazines, radio and newspapers and concentrated on the safety benefits of wearing bicycle helmets.

Advertisements run during this period were the 'Mutant Ninja Turtles', popular television characters, for the children under 12 years, whose theme was "Be a turtle, wear a shell" and the "Helmets in sport" advertisement from Phase I for children 12-16 years. Also, a "chalk line drawing" advertisement, comparing the effect of an unhelmeted head hitting bitumen and a helmeted head hitting bitumen, targeted all bicyclists.

The campaign was extended to non-english speaking background (NESB) communities in the form of announcement style advertisements in NESB newspapers timed to coincide with both phases of the legislation. The 12 communities targeted were those who were considered least likely to come

into contact with mainstream media. Two NESB project officers were employed by the RTA to co-ordinate this effort. Promotion included a radio helmet competition on the NESB radio broadcaster and promotional showbags at community language schools. Also, a helmet buying guide was translated into the appropriate community language. The NSW Health Department provided funding assistance for brochure translation.

Within the RTA regions, the focus of bicycle activities was provided by the state campaign. However, the regions incorporated further promotion providing a local feel.

The campaign also included sponsorship/involvement in:

- Sydney Festival 'Park to Park' helmet ride, January 1991
- Commonwealth Cycle Classic for professional bicycle riders
- Great NSW Bicycle Ride, from Mudgee to Sydney April 20-28
- Spring Cycle Classic
- Bicycle Week in October
- McDonalds/RTA Great Obstacle Race 22 June to 1 July, in which 30 outlets participated
- Competition run in Sunday Telegraph with major prize of bicycle and helmet, and minor prizes of helmets

3.5.3. Tracking Results of the Campaign Message

The effectiveness of the message promulgated by the bicycle helmet campaign was tested via tracking surveys conducted in January, just after the introduction of the legislation for riders aged 16 years and older, and April and May, prior to the introduction of the legislation for all riders to wear helmets. The RTA advertising campaign on air throughout NSW in December, 1990, concentrated solely on the new law.

The results of these surveys (Newspoll, 1991) indicated that :

January - total recall (aided and unaided) of bicycle helmet advertising was 92%. This result could be due to not just the advertising, but also the constant media coverage given to the law prior to and just after its introduction. This level of recall showed that the campaign, as an awareness tool, had worked in ensuring the general public was aware of the bicycle helmet legislation.

In terms of recall of the advertising content, 99% of respondents claimed to be aware of the new law for bicyclists to wear helmets, with a respectable 80% accurately indicating the date this law came into effect, but 12% of respondents stated they did not know the date of legislation introduction. With age-appropriate legislation, 68% correctly indicated the age to which

this new law applied, with 24% thinking it related to all ages.

Eighty five percent of respondents approved the introduction of the legislation.

April - respondent approval of the January legislation was 88%, and respondent approval for the July legislation was 97%.

May - respondent approval for the July legislation introduction fell to 89%.

Thus, it would appear that the NSW community was aware of the change in legislation relating to bicycle helmets, although, in some respects, hazy on detail, and were generally in favour of helmet legislation.

4 OUTCOMES OF LEGISLATION CHANGE AND PROMOTIONAL CAMPAIGN

4.1. PUBLIC ATTITUDE TO BICYCLE HELMETS

- 4.1.1. Pre-legislation (1989)
- 4.1.2. During legislation introduction (1991)
- 4.1.3. Post-legislation (1994)
- 4.1.4. Summary

4.2. BICYCLE HELMET WEARING RATES

- 4.2.1. At intersections
- 4.2.2. To and from school
- 4.2.3. At recreation areas
- 4.2.4. Summary

4.3. QUALITY OF BICYCLE HELMET WEARING

- 4.3.1. At intersections
- 4.3.2. To and from school
- 4.3.3. At recreation areas
- 4.3.4. Summary

4.4. CASUALTIES

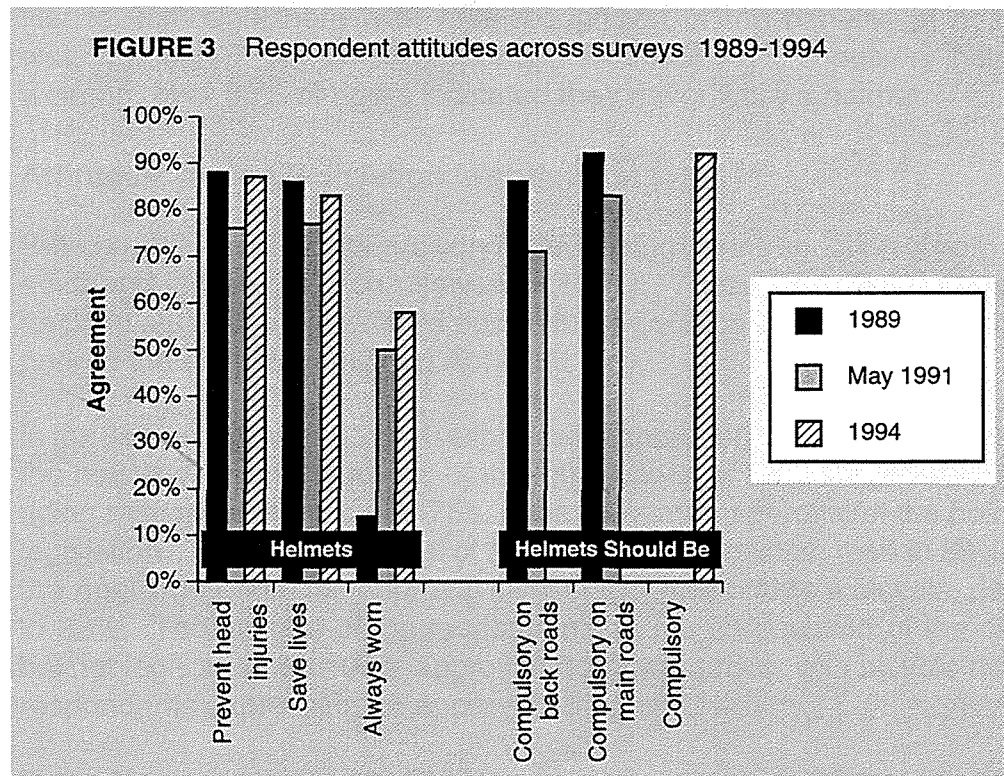
- 4.4.1. Bicyclist
 - 4.4.1.1. Severity
 - 4.4.1.2. Age
- 4.4.2. Other road users
 - 4.4.2.1. Severity
 - 4.4.1.2. Age
- 4.4.3. Summary

4.5 BICYCLIST TRAUMA

- 4.5.1. Head
- 4.5.2. Other than head
- 4.5.3. Coffs Harbour experience
- 4.5.4. Summary

4.1 PUBLIC ATTITUDES TO BICYCLE HELMETS

The RTA commissioned attitude surveys pre-legislation and post-legislation and during the introduction of the legislation (1991). Figure 3 indicates the attitude trend across surveys.



4.1.1. Attitudes, pre-legislation (1989)

The initial survey (REAK, 1989) aimed to obtain information regarding, among other things, attitudes to helmet wearing generally and compulsory legislation in particular.

Generally, the benefits of wearing a bicycle helmet were widely recognised and mostly convincing to the community and there was substantial agreement that bicycle helmets should be made compulsory. Those who cycled were far less likely to agree with this sentiment, but the majority of bicyclists still agreed that helmet wearing should be compulsory. Eighty eight percent of respondents, bicyclists and non-bicyclists equally, were convinced that helmets prevent head injuries, with 86% claiming they were convinced that bicycle helmets save lives. The percentage of respondents in favour of compulsory helmet wearing, was 71% for riding on back streets and 86% for riding on main streets. The survey established that one in five bicyclists over 14 years of age owned a bicycle helmet, with 14% claiming to wear it all the time, but 82% indicated that they never wore a helmet. Those who rode more frequently were more likely to wear a helmet all the

time, contrasting with those who rode for pleasure. The stated reasons for not owning/wearing a bicycle helmet were laziness, perceived unattractiveness of helmets, and perceived lack of need. Parents indicated that their bicyclist child did not own/wear a helmet due to the lack of perceived risk and a basic dislike/unwillingness of the child to wear a helmet.

Hence, although there was wide recognition of the benefits of helmet wearing, with 7 out of 10 respondents supporting compulsory helmet wearing, over 80% of riders indicated they never wore a helmet.

4.1.2. Attitudes, during legislation introduction (1991)

Several attitude surveys were conducted during the introduction of both the adult and child legislation (Newspoll, 1991). These were in the form of tracking studies, administered post-adult legislation in late January, then prior to the child legislation in April and May.

In the January survey, 85% of respondents approved/strongly approved of the new law, with 99% aware of the introduction of the new law. Bicycle riding respondents indicated 76% approval/strong approval of the helmet legislation. The approval level of the 1 January legislation rose to 89% by the April study, with the approval level of those who rode a bicycle, rising to 82%. The attitude of the respondents to the introduction of the child helmet legislation was 97% approve/strongly approve, with bicycle riding respondents expressing an approval rating of 82%.

In the May survey, the approval level for the new child helmet legislation had fallen to 89%. Sixty five percent of regular bicyclists indicated they always wore a helmet, with 25% indicating they never wore a helmet. Twenty three percent of occasional bicyclists always wore a helmet, while 61% indicated they never wore a helmet. Eighty three percent of respondents considered that it should be compulsory for helmets to be worn when riding on back streets and 92% agreed there should be compulsory wearing of helmets when riding on main streets. Most bicyclists (64%) considered that helmets felt comfortable. Over 76% of respondents were convinced that bicycle helmets prevent head injuries, with 77% convinced that helmets save lives.

In summary, respondent's stated approval for compulsory bicycle helmet wearing was high, with the approval level for adult compulsory helmet wearing rising from January to May, and the approval level of child compulsory helmet wearing falling slightly from April to May. Self-report of always wearing a helmet when riding rose from 14% (1989) to 65% for regular riders (May 1991) but was only 23% for occasional riders (May 1991). The level of conviction that helmets save lives and prevent head injuries fell from 86% and 88% respectively in 1989, to 77% and 76%

respectively from April to May 1991.

4.1.3. Attitudes, post-legislation (1994)

In this survey (AGB McNair, 1994), over 83% of those interviewed indicated that they were convinced that bicycle helmets prevent head injuries and save lives, representing a recovery of 6 percentage points from the May 1991 result. Amongst children 14-17 years, more than 90% were convinced of this, but amongst 18-24 year olds, less than 78% were convinced of this. Those respondents who considered they rode regularly were less convinced of the benefit of bicycle helmets than those who never rode. Of serious riders, who trained or competed, 100% were convinced that helmets prevented head injuries and saved lives. Respondents who were commuters or those who used the bicycle as a form of transport were less likely to be convinced as to the usefulness of helmet wearing (<77%).

Males (70%) were more likely to report that they rode bicycles regularly² in comparison to females (30%) with male bicyclists 14-17 years being the predominant regular riders (32%). Males 25-39 years were the predominant occasional³ riders (46%). Bicycle use was limited, with 73% indicating that they rode once a year or less, or not at all, particularly respondents older than 25 years. The primary use of bicycles was for recreation (79%), with 16% using their bicycle for commuting or as transport.

Approval rating for compulsory helmet wearing was 92%, with males and females equally supportive. Respondents 18-24 years were least approving of compulsory helmets (85%), with younger (14-17 years) and older (55+ years) respondents being most supportive of the legislation, 97% and 96% approval respectively.

4.1.4. Summary

There was strong, maintained support for compulsory helmet wearing. Prior to legislation, compulsory helmet wearing had an approval rating of over 70%. Throughout the campaign and subsequently, approval of the legislation has risen, and as of 1994 was 92%.

4.2 BICYCLE HELMET WEARING RATES

Wearing rates were assessed through observational surveys conducted from 1990-1993 inclusive (Walker, 1990; Walker, 1991; Walker, 1992; Smith and Milthorpe, 1993). The surveys were designed to assess wearing rates at intersections, but also included observations at recreation areas

² Regular rider, rode bicycle at least once every week

³ Occasional rider, rode bicycle at least once every 2 to 3 months

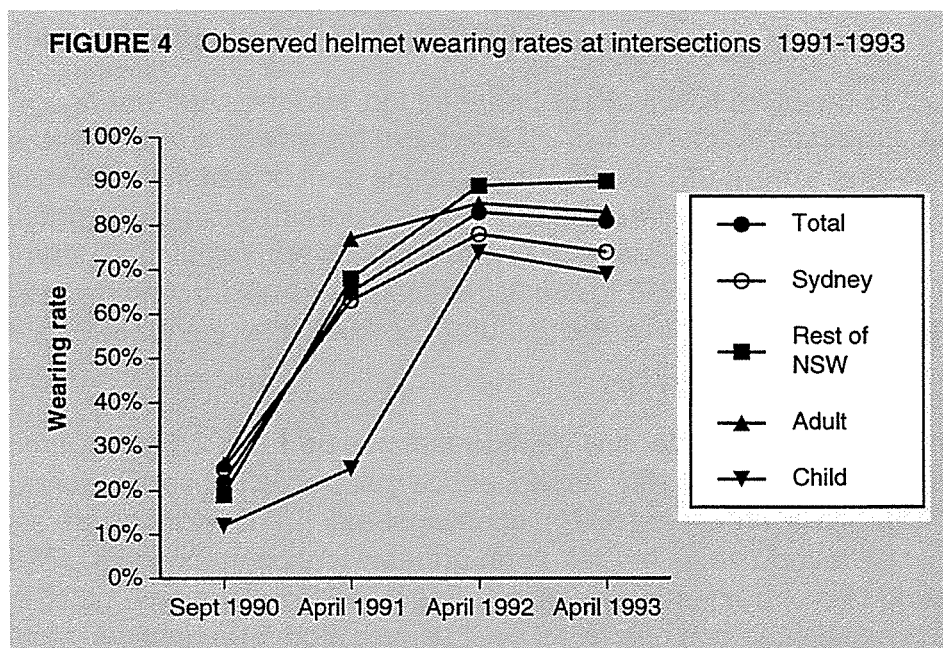
and of pupils riding to and from school. As the survey design was developed to focus on intersections, observation sites in the Sydney Metropolitan area were selected to provide a representative sample geographically, socioeconomically and by road type. Outside Sydney, sampling was based on Statistical Divisions of NSW, with intersections chosen based on local knowledge of bicyclist usage.

4.2.1. Helmet wearing at intersections

From the first survey prior to legislation, the overall observed bicycle helmet wearing rate for NSW was 22% (Walker, 1994). All intersection data for 1990 was supplied by the researcher in a private communication. Subsequent intersection data was obtained from the designated reports. As indicated in Figure 4, the Sydney wearing rate was 25%, with bicyclists outside Sydney having a 19% observed wearing rate. The adult wearing rate (26%) was higher than the child wearing rate (12%) and male helmet wearing (22%) was slightly above that of the female wearing rate (19%).

At the time of the second observational survey in April 1991 (Walker, 1991), bicycle helmets were mandatory for adults, but not for children less than 16 years of age. Wearing rates had risen across the state to 65%, with adult wearing rates jumping to 77% and child wearing rates rising more modestly to 25%. The Sydney wearing rate (63%) fell behind the 'rest of NSW' wearing rate (68%) and both males and females had similar wearing rates (65%).

Survey three in April 1992 (Walker, 1992), was the first to incorporate the mandatory helmet wearing for both adult and child bicycle riders, and also



occurred after bicycle helmet exemptions were withdrawn. This was also the first survey to classify helmet wearing as correct or incorrect. The general wearing rate for NSW had again risen (83%), with increases registered for both adult and child riders. The wearing rate for child riders jumped markedly to 74%. Sydney helmet wearing (78%) was again below the 'rest of NSW' wearing rate (89%), as was the child wearing rate (74%) below that of the adult rate (85%). Female helmet wearing (86%) was slightly ahead of the male wearing rate (83%).

The last survey, conducted in 1993 (Smith and Milthorpe), showed a slight downward trend in intersection helmet wearing. The overall NSW wearing rate fell marginally to 81% with the drop attributable to the Sydney helmet wearing rate (74%). For the 'rest of NSW', helmet wearing (90%) remained stable. Both the adult (83%) and child (69%) helmet wearing rate was down on the 1992 rate, as was the male (80%) and female (87%) wearing rate.

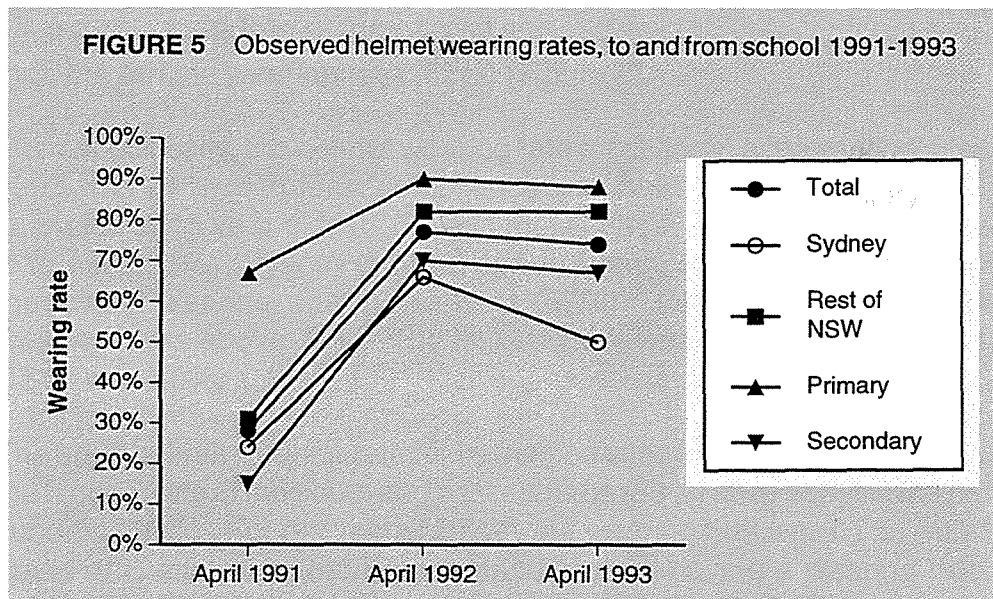
In a more specific analysis of wearing rates for child riders at intersections in 1993, those riders least likely to be wearing helmets, were riders less than 6 years (47%), with 6-9 year olds recording the highest wearing rate of 81%. Sydney child riders had an observed helmet wearing rate of 56%, with the highest wearing rate in the northern suburbs (73%) with south, east and west Sydney recording a wearing rate below 53%. Child riders elsewhere in NSW had an 80% observed helmet wearing rate.

In respect of adult riders at intersections in 1993, the Sydney wearing rate was 77%, with the Sydney north wearing rate of 87% the highest, and the lowest wearing rate was Sydney's western suburbs (70%). Adult wearing rate throughout the remainder of NSW was 92%.

4.2.2. Helmet wearing, to and from school

Although the surveys were not intended to provide a measure of bicycle use, there was a downward trend of 47% in the number of bicycle riders observed riding to and from school from 1991 to 1993. However, helmet wearing in this group has increased. Prior to the introduction of compulsory helmets for children, the school wearing rate was 28% in April 1991. This rose to a high in the first year post-legislation of 77%, but fell slightly to 74% in the 1993 survey, with the drop attributable to a fall in the Sydney wearing rates.

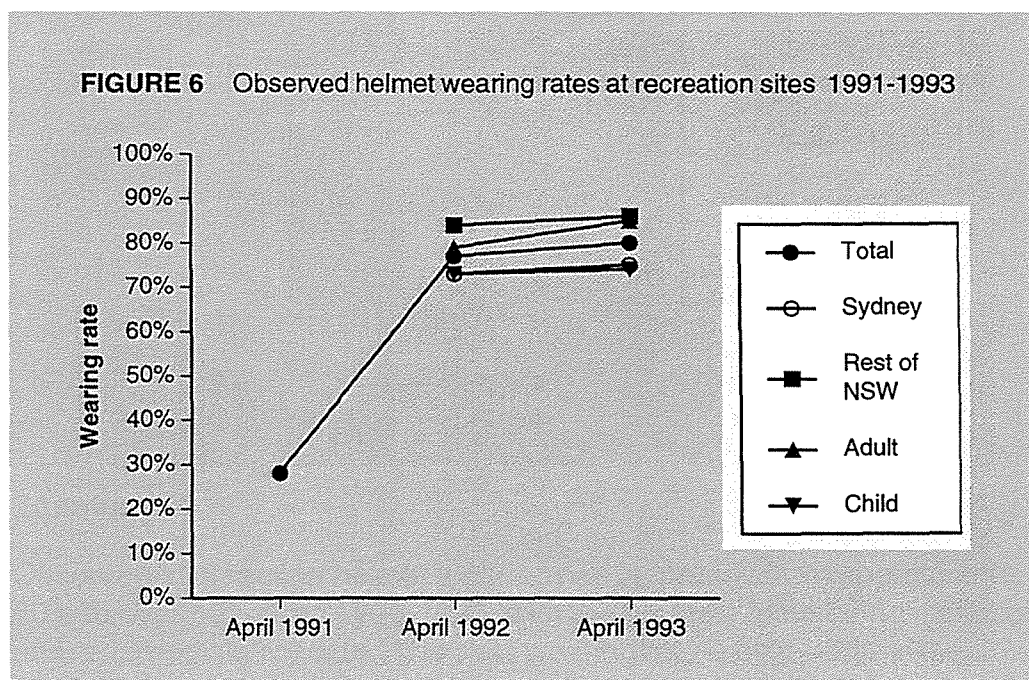
From Figure 5, it can be seen that primary school wearing rates were far superior to those of secondary school riders, with primary school wearing rates rising from 67%, pre-legislation (1991), to 88% post-legislation (1993). Secondary school wearing rates, for the same period, were 15% and 67%. The 'rest of NSW' wearing rate was observed to be above the Sydney wearing rate, both pre-(31% vs 24%) and post-legislation (1993 -



82% vs 50%). Male and female wearing rates have been similar, rising from approximately 30% to 74%.

4.2.3. Helmet wearing, at recreation areas

Observation data for recreation sites was first clearly quantified across categories in the 1992 survey. It appears that the number of riders observed from 1991 to 1993 at recreational sites throughout NSW has increased by 25%, rising from 3,107 to 3,876. The wearing rate at these sites has risen from 28% (1991) to 80% (1993). In the 1993 survey, the 'rest of NSW' helmet wearing rate at recreation sites (86%) was above the Sydney wearing rate (75%), child rider wearing rates (70%) were below

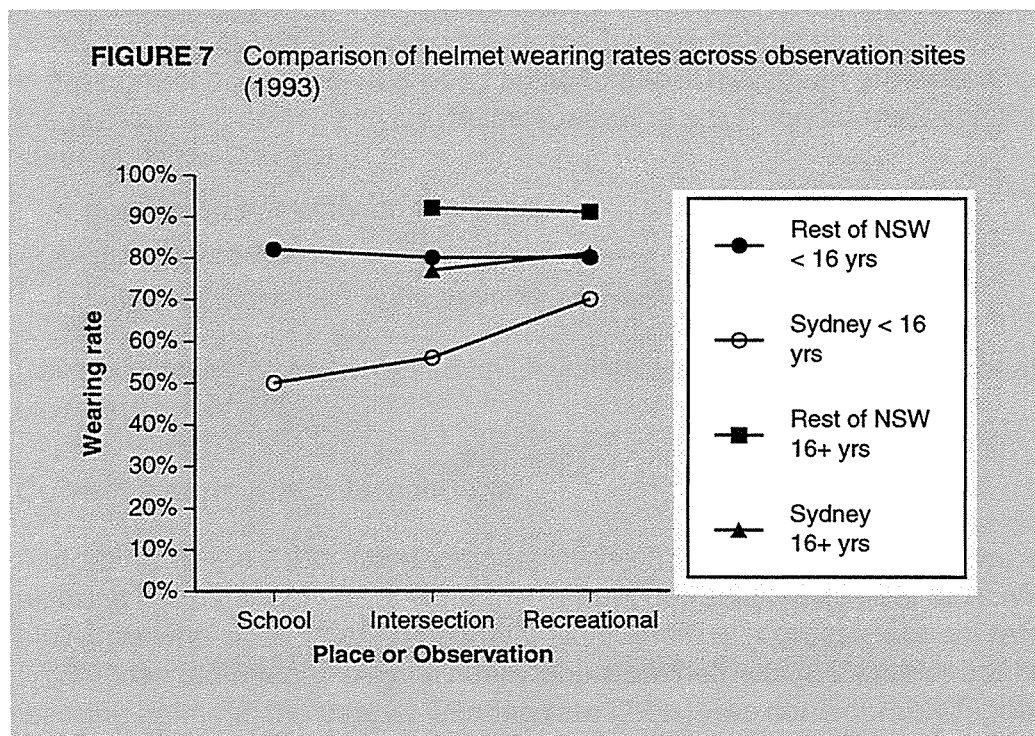


adult rider wearing rates (85%), and the male wearing rate (77%) was less than the female wearing rate (82%) (Figure 6).

More specifically, the helmet wearing rate for children at recreation sites in 1993 was 74%, with least compliance with helmet wearing amongst 13 year olds to 15 year olds (60%) and most compliance by children 6 years to 9 years (83%). Sydney children had an overall wearing rate of 68%, with the lowest wearing rate in the west (57%). Other Sydney areas had wearing rates above 73%. The child helmet wearing rate for the 'rest of NSW' was 80%.

The adult helmet wearing rate for recreation sites in Sydney was 81%, with the highest rate in the south and east suburbs (89%) and lowest in the north suburbs (66%). For the 'rest of NSW', the wearing rate was 91%, with the areas of Hunter, Gosford/Wyong and Illawarra having a wearing rate of 93% while other NSW areas recorded a wearing rate of 83%.

In Figure 7 there is a comparison of wearing rates for 1993 over the three types of observation sites. Over all sites, Sydney child riders have the lowest helmet wearing rate, with the 'rest of NSW' adult bicyclists having the highest helmet wearing rate.



4.2.4. Summary

Observed intersection helmet wearing has increased from approximately 20% to over 80% from 1990-1993, with the greatest jump being recorded after each legislative date. The child wearing rate is below that of the adult

wearing rate, with this result consistent across surveys. Area of helmet wearing has also demonstrated a similar result, with Sydney wearing rate below the 'rest of NSW' wearing rate.

Although riding to/from school has apparently decreased since the introduction of the observation surveys, helmet wearing has increased, from 28% in 1991 to 74% in 1993, but this rate is below the overall wearing rate. Secondary school students and Sydney students have helmet wearing rates markedly lower than that of primary students and the 'rest of NSW' students.

At recreation sites helmet wearing has risen from 28% (1991) to 80% (1993). The Sydney wearing rate and child wearing rate was again below that of the 'rest of NSW' wearing rate and adult wearing rate.

In general, the observed female helmet wearing rate is higher than the observed male helmet wearing rate.

4.3. QUALITY OF HELMET WEARING

Much of the potential safety benefit of wearing a bicycle helmet can be lost if the helmet is not in the correct position on the head and/or not strapped correctly. In the event of an accident, the bicycle helmet needs to remain in the correct position on the head so as to afford maximum protection for the wearer. Correct bicycle helmet wearing was considered, for the surveys, to be :

- positioned correctly on the head
- strap was fastened
- fastened strap was sufficiently tightened

Correct wearing rate was based on bicyclists wearing helmets only, not all bicyclists observed.

4.3.1. Correct wearing, at intersections

According to the 1992 observations, of the 83% of bicyclists who were wearing helmets, only 68% wore the helmet correctly. The 'rest of NSW' bicyclists who were wearing helmets, wore them at a greater correct rate (70%) than did Sydney bicycle riders who wore helmets (66%). For adults wearing helmets, the correct wearing rate (72%) was considerably higher than the child correct wearing rate (50%) for those who wore helmets. Male and female bicycle riders had similar correct helmet wearing rates at 66% and 68% of helmet wearers respectively.

An analogous correct helmet wearing pattern for the 1993 survey was

observed. Of those riders wearing helmets, Sydney correct wearing rate (65%) was still below that of the 'rest of NSW' correct wearing rate (70%), child correct wearing (46%) was still below adult correct wearing (72%), with males (67%) and females (70%) having similar correct helmet wearing behaviour, amongst those wearing helmets.

4.3.2. Correct wearing, to and from school

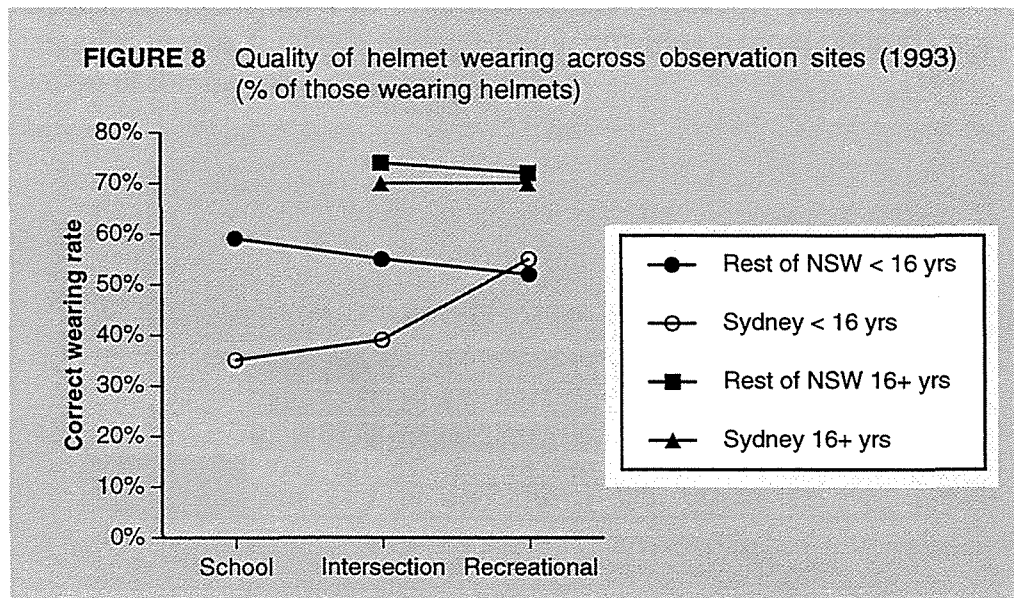
In the latest survey (1993), the quality of helmet wearing of school riders was very poor, with only 53% of those observed wearing helmets, wearing the helmet correctly. Sydney school bicyclists were observed wearing their helmets correctly in only 32% of riders wearing helmets, with 'the rest of NSW' school children correctly wearing their helmet for 58% of observations where a helmet was worn. Male (52%) and female (56%) riders' correct wearing rate was similar.

4.3.3. Correct wearing, at recreation areas

Correct helmet wearing at recreation areas, as observed in the 1993 survey, was 62% of those wearing helmets. "Rest of NSW" (67%) and adult (71%) correct wearing was higher than the Sydney (60%) and child (46%) correct wearing rates. For this particular observation, the male correct wearing rate (67%) was greater than the female (60%) correct helmet wearing, though in general, female wearing rates and quality of wearing is superior to male bicycle riders.

4.3.4. Summary

To put all these results in perspective, this means, that of the bicycle riders observed in 1993, only 53% wore helmets which provided maximum



protection, 27% wore helmets which would be unlikely to provide protection in the event of an accident and 20% were not wearing a helmet.

Correct helmet wearing is most likely in on-road situations (intersection) and least likely in off-road (recreation) conditions.

Figure 8 indicates the quality of helmet wearing across observation sites in 1993. These results pertain to those bicyclists wearing helmets only, not all riders observed.

4.4. CASUALTIES

In the decade prior to the introduction of compulsory bicycle helmet wearing, bicyclist fatalities, were, on the average, 23 per annum and there was an increasing trend for bicyclists to sustain injury, both serious and other. This bicyclist casualty trend changed after the introduction of compulsory helmet wearing. Unless otherwise stated, bicyclist trauma data is determined from Police accident reports. NSW Health data provides a similar picture regarding serious injury, although it is considered that both databases under-estimate bicyclist injury.

4.4.1. Bicyclist

4.4.1.1. Severity

As evidenced in Table 3, the largest decrease in bicyclist casualty from 1990-1993 has been in fatalities which fell from 20 to 8 (60%). In the same period, serious injury decreased from 349 to 275 (21%). Total bicyclist casualties declined by 23% (1880 to 1451) from 1990-1993. As bicyclist fatalities are few in number, statistical results are vulnerable to random fluctuation and should be interpreted with caution. As such, serious casualty, that is, fatality + serious injury, provides a more rigorous appreciation of the bicyclist casualty situation.

TABLE 3 Fall (%) in casualties/fatalities from 1990-1993. For comparison, other road casualties vs bicyclist road casualties, and adult bicyclists vs child bicyclists. Statistics supplied by Analysis Section, Road Safety Bureau, RTA.

	FALL (%) IN CASUALTIES 1990-1993											
	All Road			Bicycle			Adult			Child		
	1990	1993	%	1990	1993	%	1990	1993	%	1990	1993	%
Fatality	797	581	27	20	8	60	13	5	62	7	3	57
Serious Injury	7546	6407	15	349	275	21	218	172	21	125	92	26

4.4.1.2. Age

From 1990-93, child (0-15yrs) fatalities were approximately 36% of all bicycle fatalities, and children accounted for approximately 34% of bicyclists injured. In this time, child fatalities fell from 7 to 3 (down 57%) and serious injury fell 26%, from 125 to 92. Adult fatalities fell 62% from 13 to 5, with adult serious injury down 21% from 218 to 172.

4.4.2. Other Road Users

The drop in bicyclist casualties should be seen in the light of the total drop in NSW road casualties.

4.4.2.1 Severity

From 1990-1993 road fatalities, excluding bicyclists, fell 24%, from 757 to 573, serious injury fell 15%, from 7197 to 6132, and other injury was down from 23,096 to 18,793 (19%). In the same period bicyclist fatalities (with the proviso of 4.4.1.1.) dropped 60%, bicycle serious injury dropped 21% and other injury fell 23%.

4.4.2.2. Age (excluding unknown age casualties)

From 1990-1993, other road user fatalities, excluding bicyclist fatalities, decreased 18%, for child (0-15yrs) road users, and 11% for adult road users. Road user serious injury, excluding bicyclist serious injury, fell 13% and 15% respectively. In this time, child bicyclist fatality decreased 57%, with adult bicyclist fatality falling 62%. Serious injury for child bicyclists fell 26% and adult bicyclist serious injury decreased 21%. Thus, in comparison to non-bicyclist road user serious casualty, bicyclist serious casualty evidenced a greater decline.

4.4.3. Summary

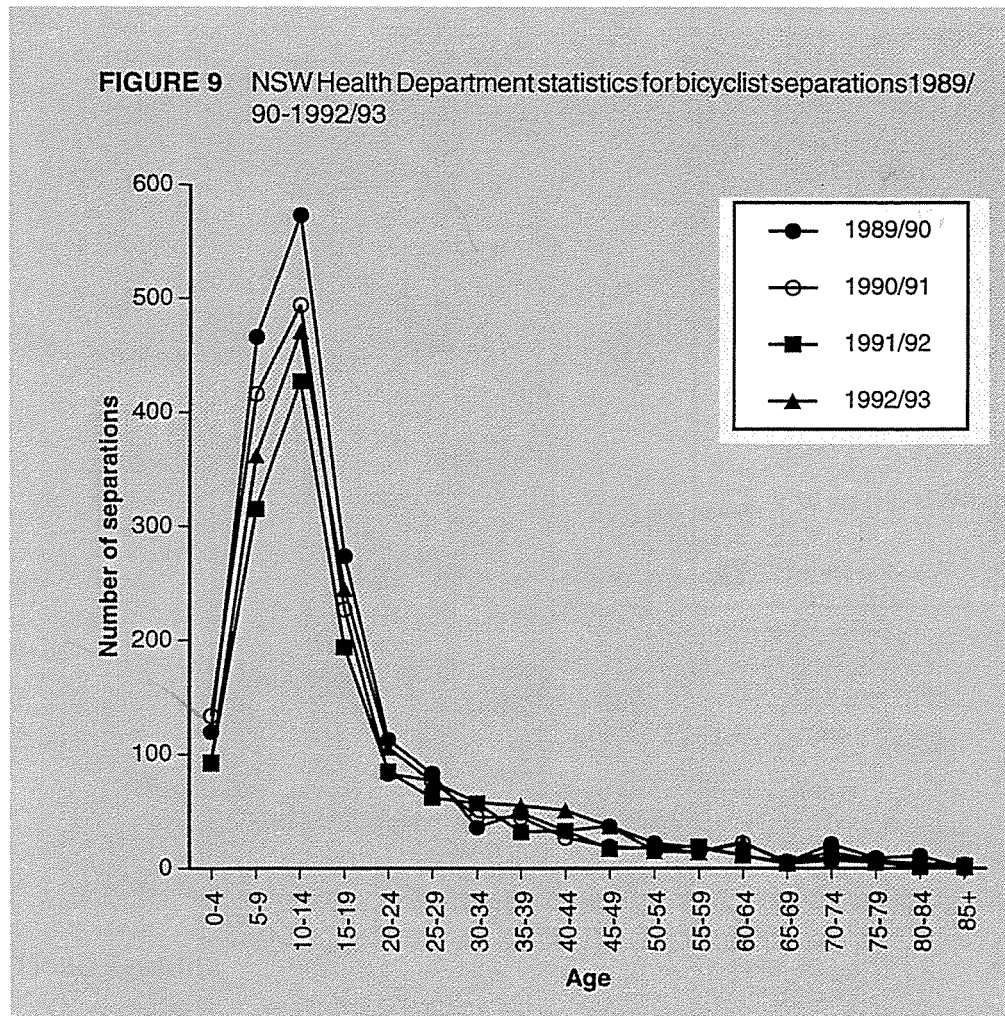
Subsequent to the introduction of helmet legislation, bicyclist serious casualty has fallen 23%. Child riders account for most bicyclist trauma, and since legislation, child serious casualty has decreased 28%, with adult rider serious casualty falling 23%. Greatest casualty reductions have been made in the more serious trauma area.

Post-legislation, bicyclist serious casualty has decreased 23% in comparison to other road user serious casualty, which has fallen 16%.

4.5 BICYCLIST TRAUMA

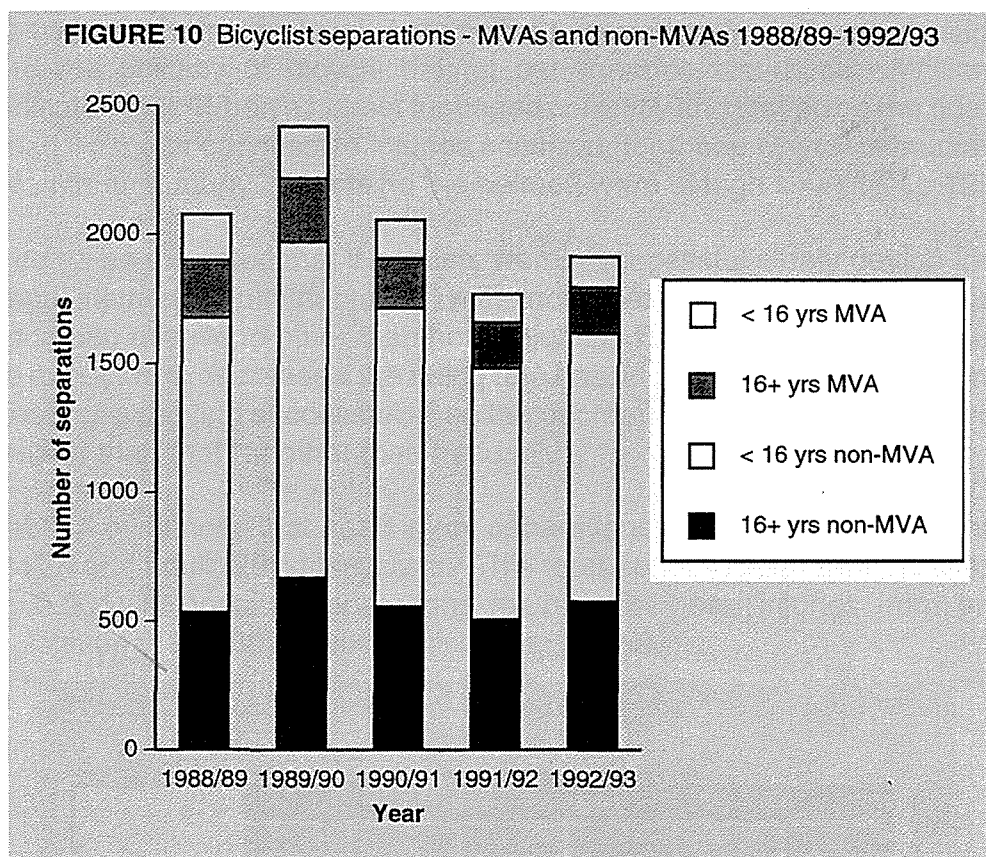
According to NSW Health Department statistics for 1989/90-1992/93, the

FIGURE 9 NSW Health Department statistics for bicyclist separations 1989/90-1992/93



majority of overall bicyclist trauma is in the 5-19 years age group (Figure 9). Note that hospital data uses "separations" as the basic unit of measurement, rather than the number of actual patients. A separation is counted when a patient is discharged and/or transferred between hospitals and/or dies. Thus, one patient may incur one or more separations. As such, NSW Health results should be considered as representing a trend, rather than individual patients. Due to the different base of the RTA statistics and NSW Health statistics, results cannot be compared.

In 1992/93, of the 1623 bicyclist separations, the 5-19 years age group accounted for 66%. Predominantly, bicyclist trauma does not involve motor vehicle accidents (MVAs), although MVAs generally result in more severe trauma (Figure 10). In the last two years (1991/92 and 1992/93), the proportion of MVAs/non-MVAs has remained relatively constant, with MVAs accounting for 10% of child bicyclist trauma and 26% of adult bicyclist trauma. Dr Victor Carey (1991) indicated that of the child bicyclists presenting to Sydney hospitals in 1990 who had been in non-motor vehicle accidents, 73% had lost control of their bicycle. Becoming entangled in the bike, hitting an object and bike malfunction accounted for 18% of the remainder of the accidents in which children were injured.



4.5.1. Head Trauma

Head trauma has been implicated as the most common cause of death and serious disability to riders in bicycle accidents (Thompson *et al*, 1989) and amongst seriously injured bicyclists, head injuries are common. Carey and McNeil (1993) investigated bicycle injury at three pædiatric hospitals in Sydney from 1990-1992. They found that of those children suffering head injuries, 85% were not wearing a helmet. In a study by McDermott *et al* (1993), head injuries were significantly less frequent in bicyclists wearing approved helmets. Generally, authors have concluded that when wearing an approved helmet correctly, casualties have a lower number of head and facial injuries and a decreased severity of head injuries.

With the Victorian experience regarding head trauma, Finch *et al* (1993) indicated that bicyclist hospital admittance for head trauma decreased by 48% in the first year post-legislation and by 70% in the second year. According to Finch *et al*, this reduction in the proportion of bicyclists with head injuries appears to be the result of (i) a reduction in the number of bicyclists involved in severe injury crashes and (ii) a reduction in the risk of bicyclists sustaining head trauma in crashes.

Williams (1991) did an evaluation of helmets worn by bicycle riders

involved in accidents in which the helmet sustained some impact. This was done to determine the level of protection provided and to gain some insight into the efficacy of bicycle helmet performance standards. Williams indicated that "When a helmet functioned correctly and stayed on the rider's head no major concussive injuries occurred [for those bicyclists studied], even though many impacts [to the helmet] were of high severity" (p.125).

It could be expected that if helmets were a successful safety device then head injuries would decrease with increases in helmet wearing and decrease relative to other than head injuries. Both types of trauma could be expected to decrease if the riding rate has, in fact declined, but if helmet wearing is proving successful, then the decrease in head injury should be greater than that for other than head injury.

Table 4 evidences that head injury separations have fallen for both child (34%) and adult (29%) bicyclists. This represents a significant decrease ($p < 0.001$) in hospital separations for bicyclist head injuries from pre-legislation (1988/89) to post-legislation (1992/93).

TABLE 4 Hospital separations for bicyclist head and other injuries 1988/89-1992/93

	BICYCLIST SEPARATIONS					%
	1988/89	1989/90	1990/91	1991/92	1992/93	
<16yrs head	414	453	384	272	273	▼ 34
16+yrs head	238	274	209	176	170	▼ 29
<16yrs other	908	1053	926	815	893	▼ 17
16+yrs other	497	642	540	508	584	▲ 18
TOTAL	2057	2422	2059	1771	1920	

4.5.2. Injuries other than head injury

Table 4 also indicates separations for other than head injury. Other than head injuries decreased for child bicyclists from the pre-legislation (1988/89) to the post-legislation (1992/93) period by 17% but rose for adult bicyclists, over the same period, by 18%.

This result would suggest that the rate of riding has declined for child bicyclists but not so for adult bicyclists.

4.5.3. Coffs Harbour Experience

Beattie has investigated bicyclist trauma, pre and post-legislation, in the NSW north coast city of Coffs Harbour. Beattie only included local

permanent residents in his study to provide stability of baseline, as Coffs Harbour is a recognised tourist destination. Beattie's data, unlike that of NSW Health, involve individual bicyclists and not separations.

In the pre-legislation phase (Beattie, 1991), of local patients admitted to the two Coffs Harbour hospitals for bicycle-related injuries, 39% of all injuries sustained by bicyclists involved head injuries. The study noted that this injury pattern reflected a low rate of helmet use. In the subsequent study (Beattie, 1994), it was shown that in the two years, post-legislation, the admission rate fell significantly, both for child bicyclists ($p < 0.01$) and adult bicyclists ($p < 0.02$). The head injury rate, in comparison to the pre-legislation period, also fell significantly for both adult bicyclists ($p < 0.05$) and child bicyclists ($p < 0.001$). The other than head injury rate for adults remained stable, but child other than head injury rate fell 51% ($p < 0.03$). Beattie (1994) suggested that the post-legislation casualty indicates that the level of adult bicycle riding has changed little since mandatory helmet wearing was introduced, while the level of child bicycle riding has decreased. Beattie further suggests that the significant decrease in adult bicyclist head trauma is a likely effect of helmet protection, whereas the significant decrease in child bicyclist head injury is likely to be a result of, not only the protective effect of helmets, but also a decline in bicycle use.

4.5.4. Summary

Since the introduction of mandatory helmet wearing, bicyclist head injury has significantly decreased. The decline in injuries may, to some extent, be a reflection of a decrease in bicycle ridership, as well as representing a significant helmet effect.

5 EVALUATION OF INTRODUCTION OF BICYCLE HELMET LEGISLATION

5.1 EVALUATION CRITERIA AND RESULTS

5.1.1. Appropriateness

5.1.1.1. Validity of reasons of helmet legislation

5.1.1.2. Continuing relevance of helmet legislation

5.1.1.3. Contribution to the goals of the organisation

5.1.1.4. Importance/priority of bicyclist trauma

5.1.2. Efficiency

5.1.2.1. Suitability for achieving program objectives

5.1.2.2. Result quality in comparison to other findings

5.1.2.3. Financial cost relative to other programs

5.1.2.4. Community acceptability

5.1.2.5. Time efficiency of implementation

5.1.3. Effectiveness

5.1.3.1. Quality of specific program outcomes

5.1.3.1.1. Helmet wearing

5.1.3.1.2. Bicyclist serious casualty

5.1.3.1.3. Bicyclist head trauma

5.1.3.2. External economic impact

5.2 SUMMARY

5.2.1. Appropriateness

5.2.2. Efficiency

5.2.3. Effectiveness

5.3 IMPLICATIONS AND FUTURE ACTION

5.1. EVALUATION CRITERIA AND RESULTS

According to the Office of Public Management (1992), a good evaluation incorporates judgements about appropriateness, efficiency and effectiveness.

Appropriateness of a program is the extent to which objectives and priorities match needs. Included in this area are:

- 1 validity of reasons for introducing compulsory helmet wearing
- 2 continuing relevance of bicycle helmet legislation
- 3 contribution of the legislation to the road safety goals of the RTA
- 4 the importance/priority of bicycle riding and bicyclist trauma to the NSW community

Efficiency is the extent to which program outcomes are achieved at a reasonable cost and in a reasonable time. Included in this area are:

- 1 the suitability of strategies, procedures etc, for achieving the program objectives
- 2 quality of NSW results in comparison to other findings/evaluations
- 3 monetary cost of implementing legislation in relation to the cost of other current NSW programs
- 4 community acceptability of the helmet legislation
- 5 time efficiency of implementation of this legislation in comparison to other road user legislation

Effectiveness is the extent to which program outcomes match stated program objectives. Included in this area are:

- 1 effectiveness/quality of outcome considered in terms of an outcomes hierarchy
- 2 external economic impact

5.1.1. Appropriateness

5.1.1.1. Validity of reasons of introducing compulsory helmet wearing

The reason for the change to legislation was the unacceptable level of bicyclist fatality and serious injury. Head injury had been implicated as a major cause of bicyclist trauma. Research suggested that properly worn bicycle helmets had the potential to reduce head injury by 85% and brain

injury by 88% (Thompson *et al.*, 1989). The premise, of the effectiveness of bicycle helmets, is as valid today as it was prior to legislation and helmet effectiveness continues to be supported by current research, e.g., Williams (1991).

5.1.1.2. Continuing relevance of bicycle helmet legislation

The application of legislation, to "public places", rather than just roads, continues to be appropriate, as the overwhelming majority of bicycle accidents in NSW do not involve motor vehicles. According to NSW Health Department data for 1992/93, motor vehicle accidents accounted for only 10% of child bicyclist separations and 24% of adult bicyclist separations. Thus, this suggests accidents are most likely to happen in areas considered by many to be "safer" riding places e.g., parks and cycleways, so the protection a correctly worn bicycle helmet affords in an accident should be available throughout the public riding domain. Since the introduction of the helmet legislation there has been a significant decrease in bicyclist head injury separations.

5.1.1.3. Contribution to the road safety goals of the organisation

The NSW Government and community has expressed the need for improved road safety, through the Road Safety 2000 Strategic Plan (1992). The bicycle helmet legislation contributes to the fulfillment of this plan, which aims to reduce fatality and serious injury to 25% below the 1990 level by the year 2000. Post-legislation (1993), bicyclist fatalities have fallen 60%, which is well ahead of the 25% goal, and serious injury has decreased 21%, which is approaching the desired outcome. Based on 1990 figures, conservative in comparison to the previous 5 year average, since the introduction of legislation, this has been a saving, in human terms, of 36 lives and 221 seriously injured bicyclists. Translated into financial terms this has been a saving to the NSW community of nearly \$50 million (based on figures provided by the Australian Road Research Board [1992]).

5.1.1.4. Importance/priority of bicyclist trauma

In relation to other road safety areas, e.g., speeding, drink-driving etc, bicycle casualty rates were not as high. However, the availability of an effective countermeasure, such as helmets, meant that safety gains could be readily realised. As the STAYSAFE Committee Inquiry into Bicycle Safety (1988) had pointed out, the cost of bicycle accidents to the NSW community was estimated to be \$100 million annually. The priority given to the compulsory helmet initiative therefore reflected the potential human and monetary savings.

5.1.2. Efficiency

5.1.2.1. Suitability for achieving the three specific program objectives

The procedures, activities, resources and management strategies utilised in this campaign appear to have been suitably applied to achieve program objectives. In fulfilling the three objectives of the legislation (see Figure 11), community knowledge and understanding of the change was achieved at the time of the legislation introduction. Also, strong community support for the legislation was achieved and maintained, as was the support of bicycling interest groups and numerous stakeholder organisations.

5.1.2.2. NSW result quality in comparison to other findings/evaluations

In comparison to the Victorian results of mandatory helmet legislation, NSW results are similar. Although the overall post-legislation increase in helmet wearing is higher in NSW than in Victoria, prior to legislation Victorian helmet wearing rates were higher, as the Victorians had initiated helmet wearing programs for some time. In NSW from 1990-93, adult helmet wearing rose over 50 percentage points while child helmet wearing rose 49 percentage points. According to Finch *et al* (1993) the post-legislation wearing rate observation in Melbourne was 65% (1991) and 76% (1992). In comparison, the NSW result was child, 76% (1992) and 74% (1993), with adults, 77% (1991) and 85% (1992).

Bicyclist trauma reduction in Victoria cannot be directly compared with NSW bicyclist trauma reduction. However, Victoria's bicyclist head injury, sustained in MVAs, has fallen 54% from pre-legislation levels to two years post-legislation, with non-head injury falling 40% (Cameron *et al*, 1994). Over an equivalent period, the NSW result, which includes all bicyclist trauma, evidenced a 32% decrease in head injury separations, with non-head injury separations increasing approximately 1%.

The NSW legislation was operational for all bicyclists within eighteen months of its announcement by the Minister, compared to twelve months for the Victorian introduction.

To achieve this result, resource input in NSW had been much lower, in terms of advertising and promotion, than it had been in Victoria. Fortunately, this has not resulted in a poorer outcome in terms of behaviour or likely safety benefits, enhancing the efficiency of the initiative.

5.1.2.3. Financial cost relative to other programs

At \$2.5m, the cost of the bicycle helmet legislation campaign, although greater than the funding for other major campaigns of that time, was a one-

off strategy, related to a specific use. Major areas of road safety, e.g., drink-driving, are on-going concerns which require large annual funding, with the annual budget for drink-driving advertising and public relations exceeding \$1 million. Bicycle issues are examined as the need arises, e.g., the June/ July 1994 bicycle campaign targeting adolescent bicyclists in western Sydney, having a budget of \$180, 000. Hence, the expected long-term safety benefits suggest that the funding for this initiative was an efficient allocation of funds.

5.1.2.4. Community acceptability

Surveys have been conducted throughout the bicycle helmet period . Prior to the legislation, 71% of respondents agreed with compulsory helmet wearing on back streets, with 86% agreeing that helmets should be compulsory on main streets. During the introduction of the helmet legislation over 85% of respondents agreed with adult helmet legislation, and over 90% of respondents agreed with child helmet legislation. The survey conducted in 1994 indicated that 92% of respondents agreed with compulsory bicycle helmet wearing. This indicates that there has been a continuing high acceptance of compulsory helmet legislation. The effectiveness of bicycle helmets, having the propensity to save lives and prevent head injuries has been widely recognised in the NSW community, with over 83% of respondents in the 1994 survey being convinced as to these safety aspects of bicycle helmets.

5.1.2.5. Time efficiency of implementation

From the recognition of the problem, as expounded by the STAYS SAFE 12 report (1988), to the implementation of the legislation took less than three years. This compares well with the introduction time for more complex initiatives involving vehicle equipment changes, such as occupant restraints.

5.1.3. Effectiveness

5.1.3.1. Quality of specific program outcomes

The effectiveness of the legislation can be considered in terms of an "outcomes hierarchy" whereby outcomes are charted upwards from the simplest, most direct outcome, i.e., implementation of the legislation, through to effects on behaviour and ultimately, casualties (Fig. 12). The effectiveness of mandatory helmet wearing can therefore be traced from the introduction of legislation, through resulting community awareness and behaviour, to helmet wearing and casualty reduction.

FIGURE 11 Outcomes hierarchy demonstrating the development of the NSW bicycle helmet legislation from community exposure, pre-legislation, to the specific program outcomes.

Specific program outcomes

1. Increased helmet wearing
2. Decreased fatality and serious injury rate
3. Decreased head injury



Change in behaviour

Intended
Wearing rate - 1. Adult : up 52% (1991)
 Child : up 65% (1992)
Trauma rate - 2. Fatality : down 50% (1991)
 Serious injury : down 17% (1991)
 3. Head injury separations :
 down 25% (1991/92)
Unintended : Possible decrease in bicycle ridership

**Change in knowledge
(Jan 91)**

**Change in attitude
(1989-1994)**

99% awareness of new helmet law
 79% awareness of introduction of new helmet law
 68% awareness of age group to which new law applies

Respondent agreement that bicycle helmets should be compulsory
 1989 - 72% 1994 - 92%



Increased awareness (1991)

92% awareness of bicycle campaign



Legislation introduced 1991
 1 January (adults)
 1 July (all)



Community exposure to information

1990/91 NSW bicycle helmet legislation campaign

5.1.3.1.1. Helmet wearing

Helmet wearing was observed to rise dramatically after each mandatory introduction date. Adult helmet wearing rose from 25% in 1990, prior to adult legislation 1 January 1991, to 77% post-adult legislation. Child helmet wearing rates were 10% (1990) and 25% (1991) prior to legislation, then rose to 76% post-July legislation. One of the outcomes of this increase in helmet wearing was the significant decrease in bicyclist head trauma, which was an objective of this program. Helmet wearing appears to have reached a plateau at about 80% and may need further input to maintain these gains.

However, this overall rate belies the level of child helmet wearing rates which are generally lower than that of adults, and particularly, wearing rates for Sydney child riders, whose helmet wearing is consistently lower than other groups of observed riders across intersections, to and from school and for recreation riding. Not only is lack of child helmet wearing a current concern, but there are indications that the quality of all helmet wearing is such that it is likely that many riders would not be protected in the event of an accident. Although the 1993 observed wearing rate was 80%, if the quality of helmet wearing is considered, then only 53% of bicyclists were wearing a helmet so that it afforded maximum protection, while the other 27% of bicyclists would be unlikely to receive any protection should they be involved in an accident. So although the objective of increased helmet wearing was achieved, quality of helmet wearing has become an issue.

5.1.3.1.2. Bicyclist serious casualty

In the period 1990-1993, bicyclist serious casualty fell from 4.5% to 4% of total NSW serious casualties. In this time, bicyclist serious casualty fell 23%, from 369 to 283, while the serious casualties among the remainder of road users only fell 16%, from 7974 to 6705. Although the bicyclist observation surveys over this period suggest that the amount of riding decreased, this does not fully account for the drop in serious casualty.

5.1.3.1.3. Bicyclist head injury

As there has been a significant decrease in bicyclist head injury separations from NSW hospitals from 1988/89 (pre-legislation) to 1992/93 (post-legislation), this specific program outcome has been supported. The NSW head injury results are consistent with those of numerous other studies, both in Australia and overseas, as to the efficacy of bicycle helmets in reducing head trauma.

5.1.3.2. External economic impact

To ascertain the probable economic effect of helmet legislation, 1989 data was considered as the pre-legislation base rate of bicyclist casualty. This is a more conservative option, as bicyclist fatality and serious injury was lower than either 1990 or the decade prior to legislation. Since legislation, bicyclist fatalities have decreased by 33 from the 1989 figure and serious injury has decreased by 149 over the same time. Other injuries sustained by bicyclists have decreased by 1040. If this is translated into dollars, based on the Australian Road Research Board figures for 1992, that has been a saving of \$47,863,820 to the NSW community in reported road serious casualty since the introduction of helmet legislation.

5.2. SUMMARY

In terms of the three rubrics for evaluation - appropriateness, efficiency and effectiveness - the introduction of the bicycle helmet legislation has been successful.

5.2.1. Appropriateness

The introduction of the legislation was a valid proposition, with unacceptably high bicyclist fatality and casualty, as a properly worn helmet has been shown to reduce both head and brain injury, both of which are factors in bicyclist fatality and serious injury. The legislation contributed to the road safety goals of the RTA, with bicyclist fatalities and serious injury exceeding or approaching the Road Safety 2000 desired outcomes of a 25% reduction in both fatalities and serious injury. The availability of a readily implemented countermeasure, with high likelihood of effectiveness, increased the priority of the bicycle helmet initiative.

5.2.2. Efficiency

The program objectives were achieved, with results similar to, and in some cases better than, those of Victoria. Although the cost of this implementation was above that of other concurrent road user programs, which are still continuing, this was a one-off strategy. Implementation was timely, from the STAYSAFE 12 recognition of a problem to the legislation being introduced, was less than three years. In the latest survey (1994), community support for compulsory helmet wearing has increased (92%) and is at its highest level since attitude surveys regarding this issue commenced in 1989.

5.2.3. Effectiveness

In regard to the three objectives - increased helmet wearing, decreased

fatality and serious injury and decreased head trauma - the legislation has been effective. All three were achieved. This success has also had a large economic impact for the NSW community, both in human and financial terms, with lives saved and the diminution of serious injury. The initiative involved State-wide intersectoral co-operation with the support of RTA regions, the community and road safety stakeholders, to achieve this result.

5.3. IMPLICATIONS AND FUTURE DIRECTIONS

The introduction of bicycle helmet legislation has had, and continues to have the support of the community of NSW. As the traffic network becomes increasing congested, and travel time increases, the bicycle has the ability, in some circumstances, to provide an alternative means of transport. The RTA guidelines for road building and land use planning incorporate consideration of bicycle requirements and Local Councils are also attempting to account for bicycles in their developments.

There needs to be a concerted effort, by both government institutions and bicycle user groups, to provide as safe a riding environment as possible, and this includes, among other things, helmet wearing. The importance of helmet wearing will be greater should bicycle usage increase as anticipated.

The bicyclist observation surveys suggest that helmet wearing, in general, is over 80%. However, there are pockets/areas in which the helmet wearing rate is particularly low, so the overall rate needs to be interpreted with caution. As the last observation survey was 1993, it is suggested that a 1996 survey be instigated to assess the current NSW helmet wearing practice.

To address helmet wearing disparity between groups, more target specific campaigns, e.g, similar to the 1994 June campaign which focused on adolescents in Sydney's west, could be a workable approach. However, a disturbing fact that appears to have emerged from the last two observation surveys, has been the apparent lack of quality of bicycle helmet wearing. The protective ability of a helmet is diminished and/or eradicated if the helmet is not worn properly. This issue apparently needs to be addressed on a State-wide basis, as all groups and areas observed evidenced a quality of helmet wearing well below that of the wearing rate suggesting that many bicyclists are riding under a false sense of security for their safety.

In summary, helmet wearing for bicyclists should still be an issue, but addressed in a target-specific way, particularly on an age and locale basis. Incorporated in helmet wearing should be a focus on correct wearing as

research has indicated that a correctly worn helmet provides the bicyclist with maximum protection even in the event of many, high severity impacts to the helmet.

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