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INJURY INDICATORS

GUEST EDITORIAL

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This is the first of two issues dedicated to injury surveillance and prevention in New South Wales. Injury prevention is gaining appropriate recognition as a public health priority, both nationally and within NSW. The current estimated burden on health care and other community resources due to injuries in NSW is $4.4 billion annually. In this issue, the articles look at measuring the size and nature of potential causal factors associated with injuries. Through this collection of articles, we can see how surveillance data can be used to monitor public health problems, identify potential risk factors, inform the planning of prevention opportunities and evaluate the strategies adopted.

The feature article on firearm injuries in NSW provides a valuable assessment of this public health problem prior to the introduction of new gun laws following the 1996 Port Arthur massacre. The article describes the epidemiology of deaths and hospital separations caused by firearms in the five-year period preceding the introduction of the new laws. In the future, comparing these data with data collected since July 1997 will allow us to assess the impact of the new legislation. The following article considers the size, nature and location of injuries to children in south eastern Sydney. The final article looks at how injury surveillance databases can be utilised to provide insight into potential risk or protective factors associated with injuries, in this case for head injuries in young children.

The next issue in this series will focus on injury prevention in action at state and local levels.

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FIREARM INJURY AND DEATH IN NSW

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This paper describes the problem of serious injuries and deaths caused by firearm injuries in NSW. It summarises the data describing deaths and hospital separations due to firearm injuries for the state. It also outlines the provisions of the current gun law, which contains specific powers for health professionals.

The Port Arthur massacre in Tasmania on 28 April 1996 led to the comprehensive reform of Australia's gun laws. All state and territory governments agreed to pass laws that would provide an integrated firearm licensing and registration scheme to meet uniform national standards. The new NSW gun law, legislated as the *Firearms Act 1996*, came into effect on 1 July 1997. The law recognises firearm violence as a public health issue and emphasises prevention by:

- allowing gun ownership only by adults who prove themselves 'fit and proper persons', including the requirement to prove a genuine reason for gun ownership
- prohibiting self-loading rifles and shotguns except in very restricted circumstances
- requiring all guns to be registered and banning private sales of guns
- requiring a 28-day waiting period before the purchase of each gun.

THE SIZE OF THE PROBLEM

During the five calendar year period from 1990 to 1994, 824 deaths by firearms were recorded in NSW (an average of 165 deaths per year). In addition, during the financial years 1990–91 through 1994–95, 995 people were hospitalised because of firearm injuries. Of these, 79 died in a hospital. This indicates 1740 serious firearm injuries during a five-year period, or around 350 injuries each year. These data do not include firearm injuries for which other medical help was sought, nor do they include injuries that were not medically treated.

FIREARM INJURIES AND DEATHS

Deaths

For the five calendar year period described, firearms were the fifth major cause of injury death in NSW (824, or seven per cent), after motor vehicle crashes (3329), falls and fractures (1932), poisoning (1855), and hanging–suffocation (1117). As Figure 1 shows, the majority of firearm deaths resulted from intentional shootings: 626 (76 per cent) were suicides, 145 (18 per cent) were homicides and 36 (four per cent) were accidents. The remainder were deaths that involved legal intervention (police shootings) or were deaths of undetermined intent.

Firearm death rates have declined since 1985. The age-adjusted firearm death rate (per 100,000) was 4.2 in 1985 and 2.4 in 1994. In 1994, the rate for males was 4.4 per 100,000 and for females was 0.5 per 100,000. The rates of male deaths and female deaths have reduced at about the same rate.

Hospital separations

Hospital separations due to firearm injuries have also dropped consistently over the five-year period. The figure for 1994–95 was 159, a 36 per cent decline from the 1990–91 figure of 250. The average number of separations was 199 per year. The age-adjusted rate of firearm-related hospitalisations per 100,000 dropped from 3.0 in 1988–89 to 2.4 in 1995–96 (Figure 2). There were regional differences in firearm-related hospitalisations. Rural areas had significantly higher rates than the state average, and some metropolitan or outer metropolitan areas (North Sydney, South Eastern Sydney and Wentworth) had significantly lower rates.

The 995 inpatient admissions during the financial years 1990–91 through 1994–95 occupied 7338 bed days, an average of 7.4 days per patient. As with firearm deaths, males accounted for 90 per cent of these admissions.

INTENT INVOLVED IN INJURIES

Self-inflicted injuries

Of all serious firearm injuries, the largest category was self-inflicted injury. Eighty-six per cent of these attempts at suicide resulted in death, approximately 125 each year. These firearm deaths constituted 21 per cent of all suicides in NSW from 1990 through 1994. The overwhelming majority of self-inflicted firearm injuries were to males (95 per cent).

Assaults

About 54 people each year were seriously injured with a firearm by another person (not counting police shootings). These assaults accounted for 16 per cent of all serious firearm injuries, 13 per cent of hospitalisations, and 18 per cent of deaths. The ratio of male to female victims was 3:1 among firearm assaults; however, in those cases resulting in death the ratio was 2:1. There were two age groups in which none of the victims survived their injuries: those aged 0 to 14 and those aged 65 or older.

Unintentional shootings

Unintentional shooting is usually the third largest category of firearm deaths, and the second largest category of firearm injuries, counting non-fatal injuries. By combining the

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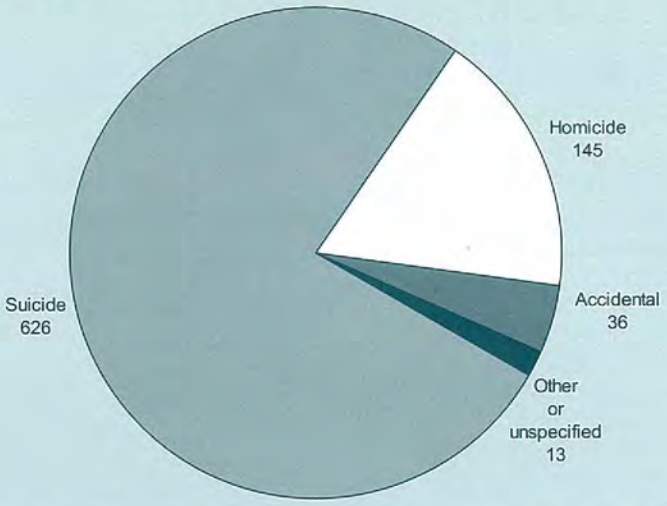
FIGURE 1

FIREARM DEATHS BY INTENT IN NSW, 1990 TO 1994 (CALENDAR YEARS)

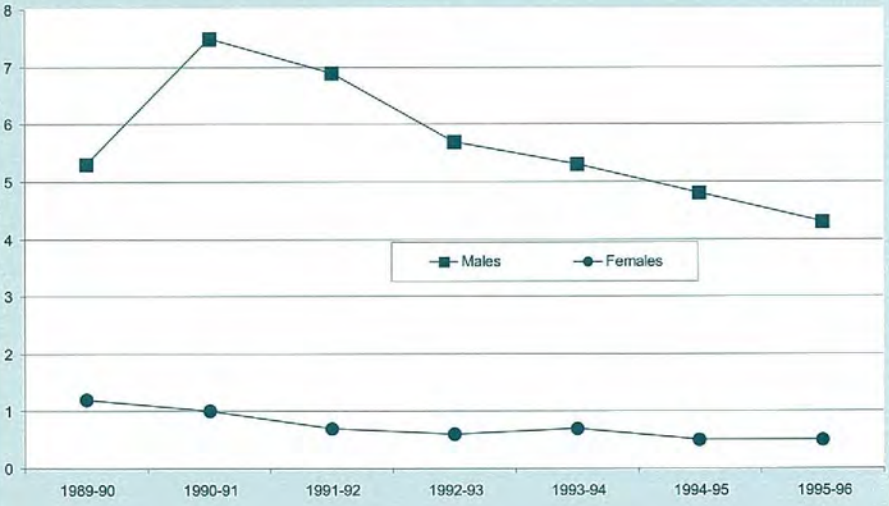


Note: Firearm injury was classified according to the ICD9 external cause codes E922, E955.0-955.4/9, E965.0-965.4, E970 and E985.0-985.4. Data excludes persons whose sex was unknown.

Source: ABS mortality data (Health Outcomes Information and Statistics Toolkit), Epidemiology and Surveillance Branch, NSW Health Department.

FIGURE 2

HOSPITAL SEPARATIONS FOR FIREARM INJURY IN NSW, BY SEX, 1989–90 THROUGH 1995–96 (FINANCIAL YEARS)



Note: Firearm injury was classified according to the ICD9 external cause codes E922, E955.0-955.4/9, E965.0-965.4, E970 and E985.0-985.4. NSW population estimates as at 31 December each year. Hospital separation rates were age-adjusted using the Australian population as at 30 June 1991. Hospital separations in 1995–96 do not include NSW residents treated in Victoria, South Australia, Western Australia or Queensland.

Source: NSW Health Department Inpatient Statistics Collection and ABS population estimates (Health Outcomes Information and Statistics Toolkit), Epidemiology and Surveillance Branch, NSW Health Department.

figures for the five years of hospital separations and mortalities, the data show that about 117 people were seriously injured in accidental shootings each year. Both deaths and hospitalisations from accidental shootings declined over the early 1990s. Hospitalisations dropped from 137 in 1990–91 to 78 in 1994–95, and deaths dropped from 10 in 1990 to two in 1994.

Similar to the pattern in self-inflicted shootings, 90 per cent of accidental injuries and 94 per cent of deaths involved males. In the five-year period, only two females died as the result of accidental shooting.

Undetermined intent

About one in 11 serious firearm injuries were of 'other' or 'undetermined' intent. These injuries, which include a small number of police shootings, accounted for nine per cent of all injuries, 15 per cent of hospitalisations and two per cent of deaths.

GENDER DIFFERENCES

Nine out of ten people seriously injured or killed with a firearm were male. Male victims made up 95 per cent of victims with self-inflicted injuries and 96 per cent of completed suicides, 74 per cent of assaults and 65 per cent of homicides, 90 per cent of accidental injuries and 94 per cent of accidental deaths.

TYPES OF FIREARMS

The Australian Bureau of Statistics (ABS) reported the types of guns that caused deaths in 625 (76 per cent) cases in NSW in the period from 1990 through 1994. Of these, 393 (63 per cent) involved hunting rifles, 193 (28 per cent) shotguns, 45 (seven per cent) handguns and 14 (two per cent) military rifles.

DISCUSSION

Firearms are an important cause of injury death in NSW (especially as a component of male suicides) with nearly half of all serious firearm injuries resulting in death. Rates of firearm injuries, both fatal and non-fatal, are several times higher in the inland rural regions than in Sydney. In this respect, firearm injury follows the pattern of injury generally.

Gunshot wounds can be distinguished from other injuries in that the victims' chances of dying are extremely high. The high level of mortality among victims of gunshot wounds has been noted in the public health literature. A study of patients admitted to Westmead Hospital in the early 1980s found that the mortality rates among gunshot victims was 3.4 times that of stabbing victims.[1] This study included self-inflicted injuries and injuries resulting from assault. The authors noted that, although victims who were stabbed were more likely to have multiple wounds (having been stabbed or slashed more than once), gunshot wounds caused far more damage to organs. A study of domestic assaults in the United States found a similar result:[2] assaults involving guns were three times more likely to result in death than assaults with knives; 23.4 times more likely than unarmed assaults; and 12 times more likely than non-firearm assaults in general.

The lethal nature of these injuries justifies the public health community's interest in this area for the purpose of prevention. If every second serious firearm injury is likely to end in death, then the benefits from preventing these injuries are great, not only in saving lives but also in avoiding disability, suffering and costs.

While firearm injury is primarily a male problem, an examination of the data by gender and intent reveals a striking difference between male and female injuries. Male firearm injuries are primarily accidents or suicide attempts, whereas female injuries result from assaults. Research on interpersonal violence has shown that women are most likely to be assaulted or killed by a member of their own family.[3,4] The greatest potential to reduce gun deaths among males may lie in the prevention of suicides using firearms; for female victims, the emphasis should be on preventing domestic violence.

This distribution of mortality–morbidity by intent is another reason why firearm injury is a public health issue in NSW and in Australia generally. Suicide and domestic violence sit squarely within the current National Health Priority Areas of injury and mental health and lend themselves to a preventive public health approach.

Gun control laws aim to prevent firearm injuries by reducing the availability of firearms generally, and especially to people who are likely to misuse them. Firearms are more prevalent in rural areas. For example, in the 1994 NSW Health Promotion Survey, 26 per cent of rural respondents said they had a gun on their property, compared with seven per cent of urban respondents.[5]

Research on the ownership of firearms involved in injuries is sparse. However, a New Zealand study of gun homicides found that most victims were killed by licensed gun owners. This suggests that guns were easily available.[6] A study of men surviving self-inflicted gunshot wounds undertaken by Westmead Hospital suggested that the immediate availability of a gun affected the choice of method of attempting suicide.[7] Although information on the source of the gun was not always available, none of the patients were recorded as having bought a gun specifically for the purpose of attempting suicide. These studies suggest that shootings may often involve guns that come easily to hand at the moment when high emotion turns to violence.

The distribution of injuries among gun types in the NSW data also points to an association between availability and misuse. The ratio of deaths caused by rifles, shotguns and handguns was approximately 6:3:1, respectively, which corresponds roughly to the proportions in which these firearms are owned in the Australian states and territories where records of firearm ownership are available.

This suggests that the involvement of guns in serious injury reflects their availability in the community. In other words, the more common a particular type of gun, the more likely it is to be used in violence.

Rates of both deaths and hospital separations due to firearm injuries have declined in NSW over the past decade. The decline in injuries may reflect:

- a drop in gun ownership (although the lack of a firearm registration system made gun ownership impossible to measure)
- strict laws on guns and domestic violence (since 1992 in NSW)
- an increasing safety-consciousness among gun owners brought about by the intense public debate on gun control after mass shootings in the 1980s
- declining cultural acceptability of firearms may have contributed to the drop in this choice of method for suicide (accompanied by an increase in hangings).

The data reported in this article do not include the period since the commencement of the *NSW Firearms Act 1996*, with the high level of publicity and discussion that heralded its introduction. The law aims to reduce the overall number of guns in the community, as well as reducing the number of guns in individual households. However, it is expected that the Act will also create an opportunity to further reduce the level of firearm injuries in NSW.

Health professionals have an important role to play in supporting the new law because it provides a specific power for health professionals to help police decide whether a particular individual should be allowed to own guns. Under S79 of the Act and R97 of the Firearms (General) Regulations 1997, doctors, psychologists, nurses and counsellors may inform the police if they are of the opinion that a patient is an unsuitable person to be in possession of a firearm:

The new gun law

On 1 July 1997, the *Firearms Act 1996* came into force in NSW. The new law implements the national gun control standards agreed to by the Australasian Police Ministers Council (APMC) after the Port Arthur massacre. Within the new law, the possession and use of firearms is confirmed as 'a privilege that is conditional on the overriding need to ensure public safety'. One of the main elements of the law is that a licence is required for civilian acquisition or possession of any gun. Licence criteria include:

- minimum age 18 (junior permits are available for children aged 12 to 18 to shoot under supervision)
- applicants must prove a genuine reason for owning guns (membership of a target club, having permission to hunt on private land, being a farmer or professional shooter, etc.)
- screening for criminal record, domestic violence, past self-harm
- minimum 10-year ban for domestic violence and certain other offenders (violence, drugs)
- police may reject licence application in the public interest.

In addition, five categories of firearms (A, B, C, D, H) based on type of gun and magazine capacity have been created. Further license criteria include:

- proof of need for any guns other than Category A
- occupational need must be shown in the case of self-loading rifles and shotguns (categories C and D).

The new *Firearms Act* also introduces the following provisions:

- maximum five-year duration for licences
- police must cancel licences and seize guns from households in which domestic violence occurs
- doctors, nurses, psychologists and counsellors may report patients who are unsuitable to possess guns
- all guns must be registered on transfer of ownership
- private and mail-order sales of guns are banned, which means that all sales must be through dealers
- a permit is required to acquire each gun, with proof of genuine reason and/or genuine need
- strict national standards for locked storage of guns and ammunition apply
- safety training is required for first-time licence applicants
- reciprocal recognition of interstate licences
- severe penalties for breaching the law.

The new gun law takes a preventive approach. It aims to restrict the availability of firearms generally by permitting gun ownership only by people who prove a genuine reason. It also aims to ensure that the individuals who have shown themselves unsuitable to possess guns are identified. There is no limit on the number of guns one person can own, but the requirement to prove genuine reason for each permit-to-acquire will make it more difficult to build arsenals.

Although the power to regulate firearms lies with the states and territories, the Commonwealth Government has also played a role. It prohibited the importation of Category C and D weapons (self-loading rifles and shotguns) and funded the national buyback, which collected and destroyed more than 640,400 of these guns.

- because of the patient's mental condition
- because the practitioner thinks that the patient might attempt suicide or would be a threat to public safety if in possession of a firearm.

Further roles for health professionals in addressing this public health problem are as credible advocates for community safety; implementing improvements in coding and collecting data; and responding to the call for further research on the circumstances of firearm injuries, both fatal and non-fatal. The skills and resources of the public health community allow its members to make a major contribution in monitoring and evaluating the legal changes that have occurred.

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Methods used in this analysis

Firearm-related hospitalisations were recorded by the NSW Inpatient Statistics Collection (ISC) for the financial years from 1989–90 to 1995–96. The ISC is maintained by the NSW Health Department's Information and Data Services Branch. It consists of demographic and clinical information collected on separation (discharge, transfer or death) from all NSW public, private and Department of Veterans Affairs hospitals and public nursing homes. Firearm deaths for the calendar years from 1985 to 1994 were recorded by the Australian Bureau of Statistics (ABS) Mortality Collection.

Both datasets were accessed via the Health Outcomes Information and Statistics Toolkit (HOIST) of the Epidemiology and Surveillance Branch, NSW Department of Health.

Firearm-related hospital separations and deaths are coded using the ninth revision of the International Classification of Diseases (ICD9) by the External Cause Code (E-code). The E-code defines the cause that best accounts for inpatient care or death in the respective collections. These codes describe both motive and type of gun involved in the injury. Air gun injuries are excluded because these guns are not assigned an identifying code by ICD9. Codes were selected for firearm-related injury to assess mortality and morbidity. They included:

E922–E922.9	Accident caused by firearm
E955.0–E955.4 and E955.9	Suicide caused by firearm
E965.0–E965.4	Assault caused by firearm
E970–E970.9	Injury due to legal intervention caused by firearms
E985.0–E985.4	Injury by firearm, undetermined whether accidentally or purposefully inflicted.

The analysis of death data used ABS population estimates at 31 December for the years 1985 to 1995 by age, sex and statistical local area. The analysis of ISC hospitalisation data used ABS population estimates at 30 June for the years 1989 to 1995 by age, sex and statistical local area. The Area Health Service boundaries at 31 May 1997 were used to present a comparison of different geographically defined population groups across NSW.

The crude death rate is an estimate of the proportion of a population that dies in a specified period. We expressed our rates as per 100,000 population. This method does not account for the different age structures of a population and can be misleading when examining long-term trends or comparisons between geographic areas.

The directly age standardised rate method accounts for differences in the age composition of the NSW and AHS populations. The method averages specific rates in a study population using the distribution of a specified population. We used the 1991 Australian standard population as our specified population. This standard rate represents the crude rate in the study population as though it had the same age distribution as the 1991 Australian standard population. The same population was used for both males and females to allow valid comparisons of age-standardised rates between the sexes.

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CHILDHOOD INJURY SURVEILLANCE: THE VALUE OF EMERGENCY DEPARTMENT DATA

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This article examines child injury data from the Sydney Children's Hospital Emergency Department database for an 11-month period. The database provides useful local information about the nature, location and type of injuries sustained by children that is essential for effective local planning of injury prevention initiatives.

INTRODUCTION

Injury has been identified as a priority area for the health system at all levels. It is a leading cause of premature death in Australia and was the fourth highest cause of mortality in NSW in 1994.[1] From 1991 to 1995, injury was the third leading cause of hospital separations among South Eastern Sydney (SES) residents, representing eight per cent of admissions.[2] However, mortality and inpatient data describing injury are limited. The emergency department (ED) is an appropriate setting to study the location of injuries on the body and where the event took place.

Despite a number of initiatives at state and national levels, there is currently no consistent approach to the collection of injury data by emergency departments. In 1990 the National Injury Surveillance Unit (NISU) of the Australian Institute of Health and Welfare introduced the Injury Surveillance Information System (ISIS) to collate data on ED injury presentations at a national level. While ISIS data provided a better understanding of the context of injuries, it was labour-intensive and implemented in a non-representative sample of 50 hospitals. Therefore, it was not able to provide incidence rates. In 1996, the NSW Department of Health introduced the Emergency Department Information System (EDIS). This involves recording of ED presentations electronically. At this stage EDIS has been implemented in an abbreviated form and in a limited number of EDs across NSW.

To assess the completeness and value of the EDIS database and thus its potential to contribute to the study of childhood injuries, we examined the EDIS injury data (January–November 1996) collated by the Sydney Children's Hospital, the major paediatric referral hospital serving the south eastern area of Sydney. During the 1996 calendar year, 21 per cent of all ED presentations at the Sydney Children's Hospital were due to injury.

METHODS

Between January and November 1996, parents of children up to the age of 15 years presenting with an injury to the ED of the Sydney Children's Hospital were asked to complete a detailed questionnaire including their demographics and information on the injury sustained. The data were entered into the EDIS database by an Injury Surveillance Officer. Completeness of the data was largely dependent upon parental consent and cooperation and is estimated to be 80 to 85 per cent complete. Data were analysed by gender, age group (0 to 4 years, 5 to 9 years and 10 to 14 years), cause, place, and type of injury, using SPSSv8 for Windows and Epi-Info v6. Severity of injury was assessed using E-codes.

RESULTS

Over the 11-month study period, data on 2549 children (1006 girls, 1543 boys) up to age 15 were recorded in the EDIS injury database. Children aged 0 to 4 years accounted for 38 per cent of presentations, compared to 35 per cent and 27 per cent in the 10 to 15 years and 5 to 9 years age groups, respectively (mean = 7 years). The male to female ratio for all ages was 1.5:1. More boys were represented in all age groups, but a significant higher proportion of boys presented among 10 to 15 year olds (male to female ratio = 1.9:1, OR = 1.43, CI = 1.20–1.69).

Cause of injury

More than half of injury presentations were due to falls (Table 1). Younger age groups were more likely to present with a fall ($p = 0.02$). Falls from low height falls (<1 metre or same level) accounted for the majority (88.4 per cent) of

TABLE 1

CAUSE OF INJURY, BY AGE GROUP

Age group	0–4 years		5–9 years		10–14 years		Total	
Type of Injury	n	%	n	%	n	%	n	%
Falls	573	56.3	380	54.7	421	46.7	1338	52.5
Low fall (<1m)	470	49.3	309	44.5	404	44.8	1183	46.4
High fall (≥1m)	67	7.0	71	10.2	17	1.9	155	6.1
Struck by object	148	15.5	155	22.3	276	30.6	579	22.7
Cut/piercing object	48	5.0	50	7.2	60	6.7	158	6.2
Scald or burn	35	3.7	11	1.5	8	0.9	54	2.2
Pedal cycling	8	0.8	20	2.9	25	2.8	53	2.1
Animal related	13	1.4	20	2.9	17	1.9	50	2.0
Poisoning	21	2.2	0	0.0	1	0.1	22	0.9
Motor vehicle	5	0.5	3	0.4	9	1.0	17	0.8
Pedestrian	4	0.4	6	0.9	8	0.9	18	0.7
Fire, flames or smoke	1	0.1	1	0.1	3	0.3	5	0.2
Near drowning	1	0.1	0	0.0	1	0.1	2	0.1
Other specified cause	116	12.0	46	6.6	67	7.4	229	8.5
Other or unspecified	16	1.7	3	0.4	5	0.6	24	0.9
Total	953	100.0	695	100.0	901	100.0	254	100.0

Data source: Sydney Children's Hospital, EDIS (January–November 1996).

TABLE 2

PLACE OF INJURY, BY AGE GROUP

Age group	0–4 years		5–9 years		10–15 years		Total	
Place of injury	n	%	n	%	n	%	n	%
Home	679	58.2	314	26.9	173	14.8	1166	45.7
School	11	1.1	138	19.9	225	25.0	374	14.7
Sporting area	5	0.5	32	4.6	187	20.7	224	8.8
Park/playground	57	6.0	70	10.8	87	9.7	217	8.6
Road	20	2.1	33	4.7	59	6.5	112	4.4
Footpath	23	2.4	26	3.7	56	6.2	105	4.4
Child care/kindergarten	60	6.3	7	1.0	–	–	67	2.7
Beach/ocean	14	1.5	14	2.0	37	4.1	65	2.6
Public swimming pool	2	0.2	9	1.3	15	1.7	26	1.0
Other/unknown	72	7.5	52	7.5	62	6.9	186	7.3
Total	953	100.0	695	100.0	901	100.0	2549	100.0

Data source: Sydney Children's Hospital, EDIS (January–November 1996).

fall presentations; however, younger children (<10 years) were more likely to present with falls from greater heights (≥1 metre), (OR = 4.21), (CI = 2.45–7.33). There was no significant difference between boys and girls.

Other causes of injury included: being struck by an object (22.7 per cent); cuts and piercings (6.2 per cent); scalds and burns (2.2 per cent); pedal cycling (2.1 per cent); and animal related accidents (2.0 per cent). Poisonings represented less than one per cent of injuries; however, 21 of 22 (95 per cent) reported poisonings were to children aged 0 to 4 years. Five children (0.2 per cent) had injuries related to fire or smoke exposure and two (0.08 per cent) presented following incidents of near-drowning.

More than eight per cent of injuries were reported as 'other specified cause'. More than half of these were injuries due to accidental pulling or twisting of a limb during play or by an adult (four per cent of all injuries) and a quarter were associated with a foreign body in the eye, ear, nose or throat (two per cent of all injuries). Fewer than one per cent of causes of injury were unspecified or missing.

Place of injury

The home environment was the most frequently reported place of injury and was identified in 45.7 per cent of presentations (Table 2). Younger children were more likely to sustain injuries at home ($p \leq 0001$). Within the home the

living room and garden/yard were the two main danger areas, representing 34.8 per cent and 21.4 per cent of home injuries, respectively. Of home injuries, 9.7 per cent occurred in the kitchen, while 4.3 per cent happened on the stairs. More than 45 per cent of children aged 10 to 15 years sustained their injury at school or on a sporting field. Park and playground accidents accounted for 8.7 per cent of injuries and road accidents 4.4 per cent. Only 18 presentations (0.7 per cent) had an unspecified place for the injury.

Severity of injury

The most common diagnoses associated with an injury were open wounds (25.5 per cent), fractures (18.2 per cent), sprains and strains (13.2 per cent) and contusions (15.1 per cent). Open wounds were more frequent among younger children, while older children were more likely to present with a fracture. There were no significant differences between boys and girls. The majority (91 per cent) of children were discharged by the ED, 193 (7.5 per cent) required admission to an inpatient ward and four (0.2 per cent) were admitted and discharged through the ED. No deaths were reported on the EDIS database.

DISCUSSION

We believe that the ED injury database provides useful information about the nature, location and type of injuries sustained by children. Unfortunately, the data were limited to an 11-month period, and we were not able to predict the pattern and burden of childhood injuries or to compare these with other NSW health areas or other states.

Falls were the single most important cause of injury presentation across all age groups; however, falls from heights greater than one metre were more frequently seen in younger children. Being struck by an object and cuts were also significant causes of injury presentation. More than a quarter of children who present to the ED as a result of an injury are treated for open wounds and almost one in five for a bone fracture. Approximately one in 10 required hospitalisation. Welcome observations included few reported (pedal) cycle accidents, scalds or poisonings. Consideration should be given to including data fields such as 'pulling or twisting of limb' and 'insertion of foreign body', which account for a significant proportion of injury presentations.

As reported by previous researchers,[3] the home environment is the most common setting for childhood injuries. This is not surprising because younger children in particular spend the majority of their time at home. Other common places of injury were the school and sporting fields for older children, and child-care centres for younger children. Attention should be given to raising awareness among parents and professionals of ways to reduce injuries in the home and at other common places of injury. It would be feasible for injury professionals, local council staff and the regulatory agency (in NSW, the Department of Community Services) to monitor safety and injury in public facilities. Education programs could also direct caregivers to seek help and to assist professionals in developing and initiating prevention strategies. Much work has been done on the safety of playground equipment and on addressing the lack of uniform standards for monitoring that equipment.[5,6]

Injury prevention strategies should be based on epidemiological evidence. Injury control depends on reliable and consistent data. There is currently a lack of adequate surveillance data, particularly at the ED level. Supporting NISU to develop and implement a national injury surveillance database will contribute to a better understanding of problems and provide baseline data to support the development and implementation of evidence-based injury prevention control programs.

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HEAD INJURIES IN INFANTS: A CLOSER LOOK AT BABY-WALKERS, STAIRS AND NURSERY FURNITURE

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This article describes the methods and findings of an analytical study of potential risk and protective factors for infants presenting with head injuries to emergency departments of seven hospitals in NSW. The Injury Prevention Policy Unit, NSW Department of Health, conducted a case-control study that examined baby-walkers, stairs and nursery furniture. The incentive for the study came from a national discussion paper on the safety of baby-walkers, which raised options for action for improving the devices by consumer safety organisations. It was apparent from the paper and from subsequent discussions that ongoing indecisiveness about appropriate action to take on baby-walkers was due largely to the lack of evidence about the injury risks they pose to infants.[1]

Injuries associated with baby-walkers usually involve infants aged less than 12 months.[2] It has been estimated that 31 to 50 per cent of children using walkers will have an injury in them.[3-5] The most common injuries associated with baby-walkers are head injuries that result from falling down stairs.[6-10]

While there are many descriptive or case-series studies in the literature about injuries associated with baby-walkers, to date there are no reported analytical studies that provide evidence about whether baby-walkers increase the risk of injury.

METHOD

A case-control study design was selected that enabled the investigation of 'exposures' in the homes of children who had sustained head injuries compared with a similar group that had not been injured. Through this analytical design, baby-walkers, stairs, nursery furniture and safety devices such as stair guards and safety straps could be examined to see whether they increase the risk of a head injury (risk factors), decrease the risk (protective factors), or show no association.

The study involved a retrospective telephone survey conducted between December 1994 and February 1995 with the parents of the infants who were either 'cases' or 'controls'. Cases were 93 infants between the ages of six and 12 months who presented with trauma to the face or head between August 1993 and November 1994 to one of seven NSW emergency departments that participate in the Childsafe Injury Surveillance System. Infants whose injury was due to motor vehicle trauma or was suspected to be associated with child abuse were excluded from this group. Infants for whom the respondent/caregiver indicated during the telephone interview that the child had not incurred a head injury during the study interval were subsequently excluded. Controls were 268 infants matched to the case infants on age (identified through the use of birth records from the same hospitals or nearby maternity hospitals) but who had not incurred a medically attended head injury between the ages of six and 12 months.

FINDINGS

Some of the significant findings were:

- After statistically controlling for socio-economic differences between the two groups of subjects (injured and non-injured), the presence of longer flights of stairs (six or more steps) in a household was the strongest predictor of head injury in the infants (odds ratio [OR] = 1.33, p = 0.05).
- In homes where baby-walkers were used and stairs were present, the risk of head injury to infants was 3.5 times greater if no stair guards or barriers were used than if they were used all the time (OR = 3.53, 95 per cent CI = 1.21–10.30).
- As shown in Table 3, those infants who used baby-walkers more frequently (OR = 2.47, 95 per cent CI = 0.97–6.48) and those who commenced using them at a younger age, were significantly more likely to have incurred a head injury during the study interval (OR = 3.02, 95 per cent CI = 1.01–9.65).

The preferred location for nappy changes was associated with significant differences between the injured cases and the control group. A higher proportion of cases (56 per cent) than controls (42 per cent) were changed on a table or bench rather than on items lower to the ground such as a bed, couch or the floor itself. (OR = 1.77, 95 per cent CI = 1.07–2.92). Furthermore, of those who used a nappy change location above the floor, significantly more controls (26 per cent) than cases (19 per cent) reported always using a safety strap or harness. The use of the safety strap appeared to reduce the chance of incurring a head injury by two-thirds (OR = 0.33, 95 per cent CI = 0.15–0.69).

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TABLE 3

COMPARISON OF CASES AND CONTROLS ON FACTORS RELATED TO THE USE OF BABY-WALKERS AND OTHER NURSERY PRODUCTS WHEN THE INFANTS WERE 6 TO 12 MONTHS OLD

Information about nursery product use	Cases, %	Controls, %	Odds ratio	95% CI
Ever used a baby-walker	39	43	0.83	0.50–1.38
Of those who used a baby-walker:				
started using it before 8 months of age	86	67	3.02*	1.01–9.65
used it at least most days	78	59	2.47	0.97–6.48
used it two or more hours/day	44	33	1.36	0.60–3.07
Of those with stairs and used walker:				
did not use stair guards or barriers	33	12	3.53*	1.21–10.30
Used high chair twice/day or more	75	66	1.56	0.89–2.77
If used high chair:				
reported always using strap/harness	83	76	1.47	0.73–2.98
Main nappy change location a bench or table†	56	42	1.77*	1.07–2.92
If nappy changed above floor:				
reported always using safety strap	19	26	0.33*	0.15–0.69
Used stroller/pram at least once most days	63	68	1.26	0.72–2.21
Stroller of lightweight, collapsible or umbrella style	42	38	1.21	0.73–2.02
If used stroller/pram:				
reported always using strap/harness	90	91	0.96	0.41–2.32

* Statistically significant, indicated by the confidence interval not including a value of 1.00.

† This includes: change tables, table or desk tops, bench tops, or dressing tables. These items tend to be higher than all other options such as bed or couch, knee, chair or toilet and the floor.

DISCUSSION

There are some limitations in the study data. One of those was that the majority of injuries were of a minor nature, which may blur the distinction between the two groups of study subjects. Another was an over-representation among the cases of parents with indicators of higher socio-economic status (significantly higher household income and significantly higher proportion who had completed Year 12 or HSC). This group may be more comfortable with accessing the health care system and more disposed to seek medical care for any (including minor) head injuries. These limitations should be considered for their potential to bias the findings of this study. Nevertheless, the study is most valuable in providing analytical evidence not yet reported elsewhere in the literature that baby-walkers, when used frequently over an extended period of a child's early development, particularly in houses with flights of stairs, may increase the risk of a head injury. These results confirm long-standing warnings by health professionals about the dangers of baby-walkers. The study also provides confirmation of the value of safety devices such as stair guards and safety straps.

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Copies of the report on this study, *Baby-Walkers, Stairs and Nursery Furniture as Potential Risk Factors for Head Injuries in Infants: A Case-Control Study*, is available from the Better Health Centre, (02) 9816 0452. Please quote State Publication Number HP 980064.

FAMILIES FIRST: A SUPPORT NETWORK FOR FAMILIES RAISING CHILDREN

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The emotional and physical development of children is most rapid during the first three years of their lives. The quality of the care they receive affects how they grow and develop, their self-confidence, feelings of security and safety, and mental health. Parents need information, support and community backing if they are to foster their children's growth and development.

This report describes Families First, a strategy sponsored by the NSW Government to reshape and develop the prevention and early intervention services that help parents and communities sustain the health and wellbeing of their children in the long term. Research shows that significant improvement in a child's health, education and welfare can be sustained when early intervention services are provided.[1,2]

The departments of Aging and Disability, Community Services, Education and Training, Health and Housing and non-government organisations funded by government already provide some of these services. Families First will link these to provide families and communities with information, support and choices to enable them to better care for their children.

First announced by the Premier in 1998, the initiative is now being implemented in three areas of NSW: the Mid North Coast, Far North Coast and South West Sydney. Families First will be progressively implemented across NSW over the next four years, supported by existing resources, plus additional funding of $54.2 million.

SERVICES UNDER FAMILIES FIRST

Families First will assist existing services to reshape as a network of universal and targeted services around four fields of activity described in the following sections. Research shows that these activities make a positive difference to the health and wellbeing of children. The benefits to families of this network will be evaluated as part of Families First.

Supporting parents who are expecting or caring for a new baby

Maternal and child health services have a particularly important role in supporting new parents. Olds found that prenatal and early childhood home visitation by nurses can reduce the number of subsequent pregnancies, the use of welfare, child abuse and neglect and criminal behaviour for low-income, unmarried mothers for up to 15 years after the birth of the first child.[1] Existing services will be reshaped to broaden the range of settings in which they are provided to families, for example, at home and in centres. Current assessment practice will be developed to include social assessments of the family in addition to the baby's health. This will allow family stresses to be identified early so that problems can be addressed.

Supporting parents who are caring for infants and young children

Parents often feel more supported when connected with other parents in their community through local playgroups, nursing mothers groups and/or by involvement in community childcare and baby-sitting clubs. These services will continue and be expanded through Families First, and information about them will be provided to parents. For example, parents who tell their general practitioner that they don't know many families in the area could be linked to the local playgroup by the general practitioner. Barker found that families in the United Kingdom who were supported at home by volunteers had improved family functioning.[3] Thus, some communities will also train volunteers to support struggling families in their homes.

Assisting families who need extra support

Some children with special needs require help from a professional such as a speech therapist, counsellor, paediatrician or a special educator. Many parents also benefit from this professional support because it helps them facilitate their child's capacity to learn and develop.

Some parents find it difficult to create a healthy environment in which their children can grow to their potentials. Drug and alcohol counselling, family therapy or a mental health support group are just a few ways to support families that need extra help.

Families First wants professionals of various disciplines who are employed by different agencies to work together to create linked services. This could result in agencies pooling funds and co-locating so that families would have access to services in one place.

Strengthening the connections between communities and families

Garbarino argues that the social fabric that surrounds families can make it easier or harder for them to manage their problems.[4] Community development activities will be introduced through Families First where communities

This report was to be included in the Bulletin's four-part series about improving the health of children in NSW, published in 1998. The series looked at evidence-based strategies that are capable of achieving needed health gains for children. Back copies of this series can be obtained through the *Bulletin*'s Web site at **www.health.nsw.gov.au/public-health/phb/phb.html**. The four issues are May, June–July, October and November 1998.

lack the informal supports and networks that help connect families.

For example, the community in a new housing development might want a parent support group and information about parenting. These services can be planned and provided jointly by the departments of Health, Community Services and Housing. The successful Schools as Community Centres program is another approach that has helped many families, and this will be extended.

IMPLEMENTING FAMILIES FIRST

Families First will require health services—maternal and child health, mental health, drug and alcohol, health promotion—to rethink how information and support is provided to families. In particular, health services will need to:

- work within a network of government and non-government services to link families to support that best meets their needs
- acknowledge that a range of activities affect health outcomes
- find new ways to reach those families that don't traditionally access services
- deliver services to families in various settings, for example, in homes, centres and community settings
- clarify the roles of health professionals in the four fields of activity, for example, mental health's role in the multidisciplinary teams.

It is believed that the integrated approach of Families First to develop self-efficacy within families and communities is an effective strategy for improving the health and well being of children.

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For more information, please contact Dianne Hudson, Office of Children and Young People on (02) 9228 5598; or email **familiesfirst@mail.cabinet.nsw.gov.au**.

A paper outlining the framework of Families First is available.

INFECTIOUS DISEASES, NSW: JULY 1999

TRENDS

Winter's arrival brought marked declines in the incidence of several notifiable diseases, including **arboviral infections** (perhaps due to fewer exposures to infected mosquitos) and **salmonellosis** (Figure 5 and Table 4). Declines were also seen in the incidence of **gonorrhoea** and **pertussis**, although some of this change may be due to delayed notification of cases.

Winter typically leads to an upswing in cases of **meningococcal disease**, prompting calls for increased vigilance among health care workers and the community for signs of this disease. Of course, doctors should treat suspected cases empirically **immediately,** even before transport to hospital, with parenteral (preferably **intravenous**) **benzylpenicillin** in a single dose of 100,000 units/kg or 60 mg/kg, to a maximum dose of 6 million units (4g). If available, **ceftriaxone** (50mg/kg for adults, or 100mg/kg for children to a maximum of 4g) intravenously or **cefotaxime** (100 mg/kg to a maximum of 2g) intravenously are preferred; however, neither are typically included in the doctors' bag. Blood cultures should be collected, prior to administration of antibiotics if possible, but their collection should not delay treatment. Your local Public Health Unit should be **notified** of all suspected cases by telephone, and PHU staff will help arrange for chemoprophylaxis for the close contacts of cases (who are at increased risk of illness).

RABIES DEATH FROM DOG BITE IN CHINA

Malcolm Rea

A resident of the Hunter Area Health Service, who had been living in China for more than a year, died in May from rabies following a dog bite that they received in China in September 1998. The patient did not receive pre-exposure or post-exposure vaccination. Because the patient died overseas, documentation on the clinical course of the disease is not yet available. Rabies infection was confirmed by the Centers for Disease Control and Prevention (CDC), Atlanta, with a positive immunofluorescence test on slides made from formalin-fixed blocked brain tissue. Further testing confirmed that the rabies virus was 100 per cent homologous with a rabies sample in the CDC virus repository from a case from China.

International travellers to countries where rabies is enzootic should be aware of the risk of rabies from bites or scratches from potentially-rabid animals (for example, monkeys, bats, dogs and cats in most countries), and information about the management of bites or scratches (that is, immediate thorough cleaning with soap and water, and urgent medical evaluation). If they are likely to come

FIGURE 3

REPORTS OF SELECTED INFECTIOUS DISEASES, NSW, JANUARY 1994 TO JUNE 1999, BY MONTH OF ONSET

These are preliminary data: case counts in recent months may increase because of reporting delays

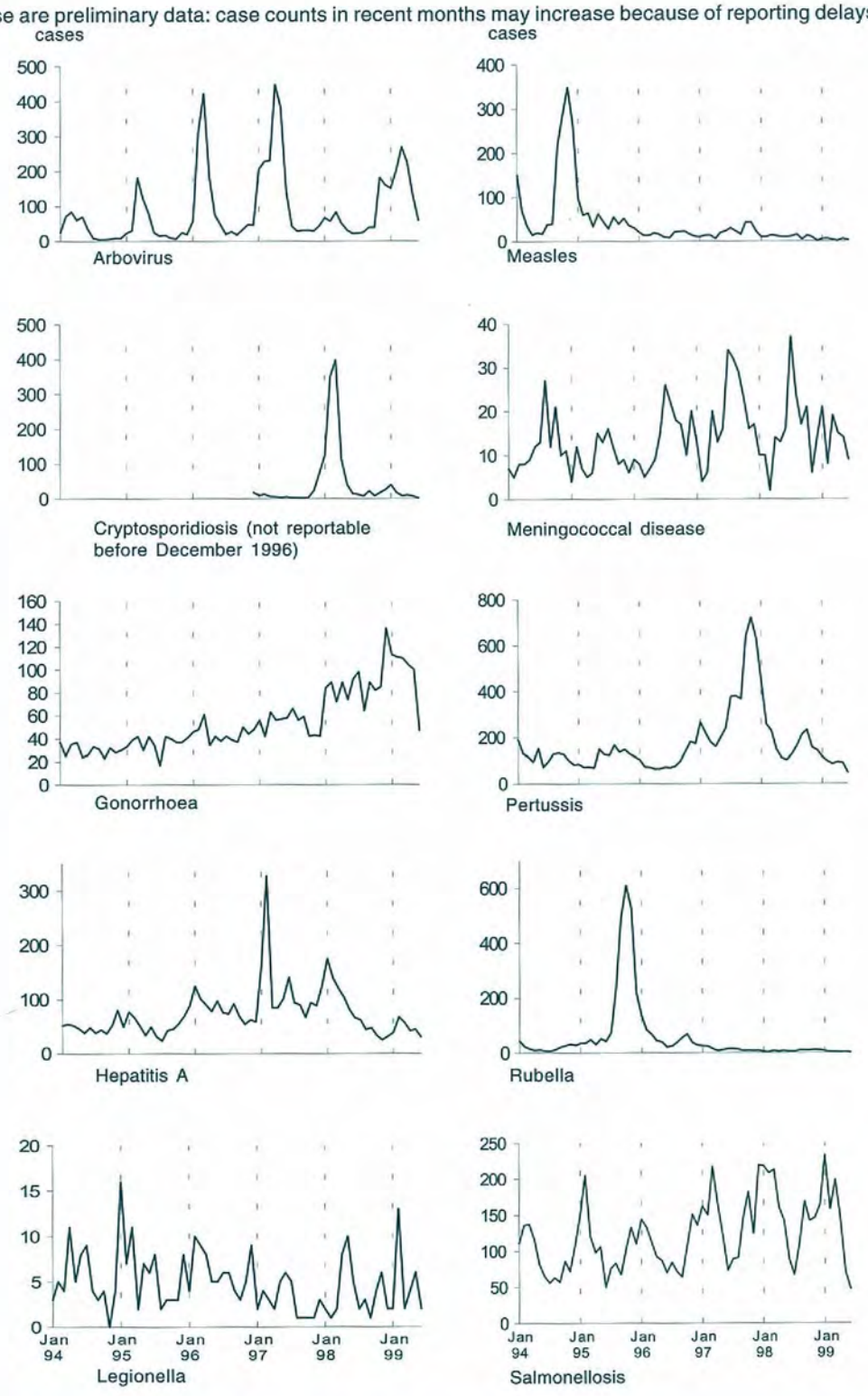


TABLE 4 REPORTS OF NOTIFIABLE CONDITIONS RECEIVED IN JUNE 1999 BY AREA HEALTH SERVICES

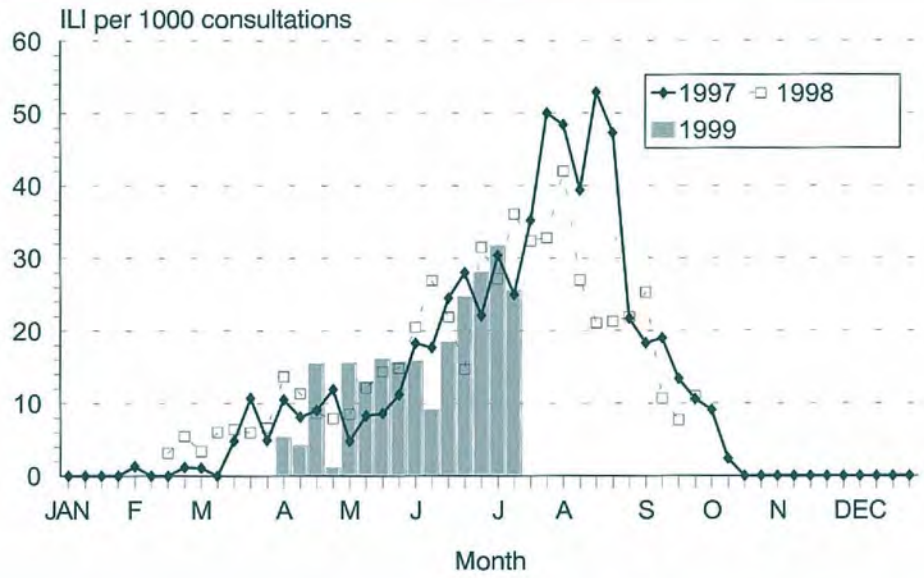
Condition	Area Health Service (1999) CSA	NSA	WSA	WEN	SWS	CCA	HUN	ILL	SES	NRA	MNC	NEA	MAC	MWA	FWA	GMA	SA	Total for Jun†	To date†
Blood-borne and sexually transmitted																			
AIDS	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	2	81
HIV infection*	–	–	–	–	–	–	–Reported second monthly–				–	–	–	–	–	–	–	–	148
Hepatitis B: acute viral*	–	–	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	3	29
Hepatitis B: other*	50	31	31	4	4	7	10	5	30	1	5	1	–	1	–	4	2	189	1592
Hepatitis C: acute viral*	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	28
Hepatitis C: other*	65	34	–	45	–	51	54	12	46	39	27	13	4	43	3	22	7	470	3549
Hepatitis D: unspecified*	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	5
Hepatitis, acute viral (not otherwise specified)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chancroid*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Chlamydia (genital)*	19	6	3	2	–	9	18	7	16	21	6	6	3	6	9	5	1	141	1106
Gonorrhoea*	21	10	1	1	1	1	2	2	31	2	1	1	1	3	2	–	–	81	643
Syphilis	7	2	2	1	–	–	–	–	5	2	4	–	1	5	3	1	–	34	296
Vector-borne																			
Arboviral infection*	–	3	–	–	–	4	4	4	2	16	15	1	2	3	5	2	12	73	1140
Malaria*	5	3	–	1	–	–	–	3	3	–	–	–	–	–	–	–	–	15	101
Zoonoses																			
Brucellosis*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Leptospirosis*	–	–	–	–	–	–	–	–	–	2	2	–	–	–	–	–	–	4	24
Q fever*	–	–	–	–	–	1	2	–	–	3	2	–	4	1	1	–	–	14	76
Respiratory and other																			
Blood lead level*	4	2	–	2	1	2	6	–	4	–	–	–	–	–	21	–	–	44	323
Legionnaires' disease*	1	–	–	1	–	1	–	3	–	–	–	–	–	–	–	–	–	6	30
Leprosy	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Meningococcal infection (invasive)	1	–	1	1	1	–	–	1	1	–	–	–	–	1	–	1	–	8	85
Mycobacterial tuberculosis	4	4	7	1	–	–	1	1	9	–	–	–	–	1	–	1	–	29	195
Mycobacteria other than TB	13	17	–	1	–	2	5	–	4	4	–	–	–	2	–	–	1	50	217
Vaccine-preventable																			
Adverse event after immunisation	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	20
H. influenzae b infection (invasive)*	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	2	6
Measles	–	1	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	3	21
Mumps*	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	10
Pertussis	7	16	3	5	7	3	33	4	8	1	2	1	–	–	–	2	1	93	630
Rubella*	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	20
Tetanus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Faecal-oral																			
Botulism	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cholera*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Cryptosporidiosis*	–	1	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	3	95
Giardiasis*	5	18	–	4	1	4	8	5	7	13	2	4	–	1	–	1	–	73	617
Food-borne illness (not otherwise specified)	–	–	–	–	–	–	–	–	–	7	–	–	1	–	–	–	–	8	16
Gastroenteritis (in an institution)	–	–	–	74	–	1	–	–	–	–	–	–	–	–	–	–	–	75	164
Haemolytic uraemic syndrome	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	8
Hepatitis A*	1	3	12	3	3	2	1	5	6	1	–	–	–	1	–	1	1	40	283
Hepatitis E*	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	5
Listeriosis*	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	11
Salmonellosis (not otherwise specified)*	3	10	1	4	1	4	4	1	5	8	4	2	2	1	–	1	2	54	930
Typhoid and paratyphoid*	–	–	1	–	1	1	–	–	–	1	–	–	–	–	–	–	–	4	14
Verotoxin producing *E. coli**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

* lab-confirmed cases only † includes cases with unknown postcode

CSA = Central Sydney Area
NSA = Northern Sydney Area
WSA = Western Sydney Area
WEN = Wentworth Area
SWS = South Western Sydney Area
CCA = Central Coast Area
HUN = Hunter Area
ILL = Illawarra Area
SES = South Eastern Sydney Area
NRA = Northern Rivers Area
MNC = North Coast Area
NEA = New England Area
MAC = Macquarie Area
MWA = Mid Western Area
FWA = Far West Area
GMA = Greater Murray Area
SA = Southern Area

FIGURE 4

NSW GP SENTINEL SURVEILLANCE—INFLUENZA-LIKE-ILLNESS, BY WEEK OF CONSULTATION, WITH HISTORICAL COMPARISONS



into special contact with animals because of the nature of their work (for example, veterinarians or wild life workers), or where immediate access to appropriate medical care (including post-exposure therapy) may be difficult, they should also be offered pre-exposure vaccination.

NSW INFLUENZA SURVEILLANCE ACTIVITY UPDATE

Summary

During the end of June and first two weeks of July influenza activity continued at a moderately high level in both laboratory diagnoses and clinical activity. The influenza season appeared to arrive earlier this year than in the previous few years, at the same time of year that respiratory syncitial virus (RSV) activity usually peaks. However, by mid-July influenza activity had not exceeded the peaks achieved in recent years.

Clinical activity

Rates of reported influenza-like illness increased during late June and the first two weeks of July (Figure 6). Reports were received each week from 30 general practitioners through four Public Health Units from more than 3100 consultations per week. Because of the often non-specific nature of influenza-like illness, these reports may include illness due to causes other than influenza viruses.

Virological activity

The laboratory reporting rate for influenza A continued at a level higher than for the same period last year, but not as high as last year's peak (Figure 7). In the second week of July, 90 cases of influenza A were reported (75 virological, 15 serological), seven cases of influenza B (six virological, one serological) and 154 cases of RSV. In the same week last year, 53 cases of influenza A, two of influenza B and 159 cases of RSV were reported. The rate of RSV isolation has been included in Figure 7 to show how the rates of these two viruses have increased at the same time of year this season, whereas in previous years influenza A had peaked later in July–August. This source of data tends to include a high proportion of hospitalised patients, particularly children, and may not accurately reflect the impact of the disease on other sections of the community.

Directed virological surveillance

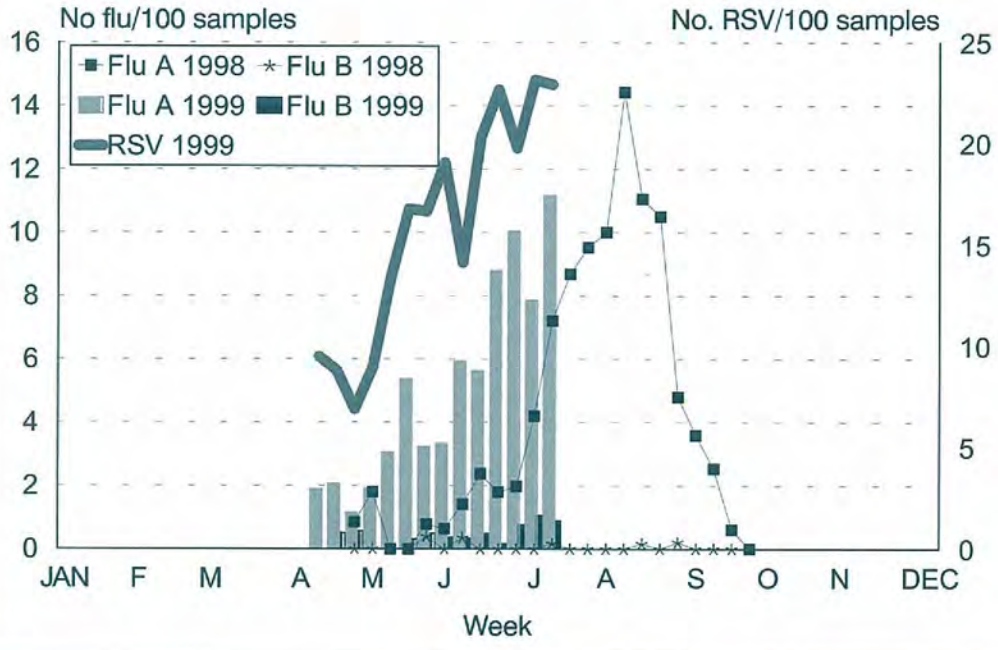
Approximately 30 nasopharyngeal swabs were received by South East Area Laboratory Service (SEALS) and the Institute of Clinical Pathology and Medical Research Westmead (ICPMR) each week from 15 to 20 general practitioners. During the second week of July, the influenza isolation rate increased to a high of 41 per cent, compared to approximately 10 per cent during May and June. Almost all swabs, and all positive swabs, have been from adults. This is in contrast to the routine diagnostic reports (see previous paragraph) which identify illness predominantly in children. Influenza A continues to be the predominant strain of influenza circulating in the community. Approximately 30 general practitioners are participating in the scheme this year from Central Sydney, South Eastern Sydney, Western Sydney, Wentworth, Central Coast, Hunter, Illawarra, Greater Murray and Southern areas.

International surveillance

No country is consistently reporting a high level of

FIGURE 5

RESPIRATORY VIRUS ISOLATION RATES, NSW, 1998–99



influenza activity. The following countries reported influenza activity to the World Health Organization in late June or early July: South Africa, New Zealand, Paraguay, Mauritius and Uruguay. South Africa reported influenza activity at the level of 'local outbreak' for the second week of July (both influenza A and B). Uruguay reported 'widespread outbreak' for the first week of July (both influenza A & B), and New Zealand, Paraguay and Mauritius reported sporadic activity for that week.

VACCINES DELIVERED DIRECTLY TO YOUR DOOR

The NSW Department of Health is committed to improving immunisation coverage rates and reducing the morbidity and mortality associated with vaccine-preventable diseases. Towards this aim, the Department has implemented the recommendation of the *Performance Audit Report on Immunisation in NSW,* conducted by the Audit Office of NSW, to improve the system of vaccine distribution.

From 26 July 1999, all vaccines will be delivered directly to all immunisation service providers each month from the newly established NSW Vaccine Centre.

All providers are reminded of the importance of reporting each immunisation encounter to the Australian Childhood Immunisation Register to facilitate the collection of accurate data on immunisation coverage in NSW and to initiate the Register's reminder system for parents.

For more information, please contact your local Public Health Unit.

THE 1998 MEASLES CONTROL CAMPAIGN IN NSW

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INTRODUCTION

Measles is a highly infectious and often serious viral illness. Complications of measles include direct effects of the virus, such as croup, bronchiolitis, pneumonia, acute encephalitis and subacute sclerosing panencephalitis, or as a result of bacterial superinfection, such as otitis media, pneumonia, etc.[1] However, the mortality and morbidity of measles and its complications can be prevented by vaccination.

The indigenous transmission of measles has been interrupted in both North and South America and in the United Kingdom through tailored vaccination programs. At a 1996 meeting of the World Health Organization, the Pan American Health Organization, and the Centers for Disease Control and Prevention in the United States, it was concluded that it was technically feasible to eradicate measles globally with the available measles vaccines if

they were used in more than a one-dose schedule.[2] While a decision was made that the initiation of a global effort to eradicate measles early in the 21st century should not interfere with the global poliomyelitis eradication program,[2] several countries are carrying out elimination programs.[2,3]

Eliminating measles is defined as the 'interruption of the transmission of measles in a defined geographical area'. Even where elimination is achieved, vaccination programs need to continue to counteract the reintroduction of the virus from other areas. Measles eradication is defined as 'global interruption of measles transmission'.[2]

As part of the elimination program in Australia, the Commonwealth Minister of Health and Aged Care launched the National Measles Control Campaign on 9 July 1998. The national campaign consisted of the following four components:

- dropping the age for the second dose of the measles, mumps and rubella (MMR) vaccine from 10–16 years to 4–5 years
- organising a mass vaccination program of children in primary schools (the Measles Control Campaign)
- sending reminder letters to parents of all children aged 1–4 years for whom the Australian Childhood Immunisation Register did not have a record of their receiving MMR vaccine urging vaccination by their immunisation provider
- sending letters through the principals of high schools urging parents to have their children vaccinated with MMR vaccine if the children have not already been vaccinated.

Following is an evaluation of the second component of the Measles Control Campaign in NSW. The aim of the campaign is to reduce the incidence of measles in the community as part of a longer term strategy to eliminate the measles virus by vaccinating children in primary schools against measles, mumps and rubella.

THE CAMPAIGN

Consultation

The NSW Department of Health consulted with the Commonwealth Department of Health and Aged Care, the NSW Department of Education and Training, the Association of Independent Schools, Catholic Education Commission and Area Health Services to develop a plan. The NSW Department of Health requested that primary school principals inform parents of the campaign.

The Commonwealth Department of Health and Aged Care distributed Principal Kits to inform the schools and Parent Packs to be distributed to the parents/guardians of the children. Parents were asked to provide consent for their children to be vaccinated at the school clinics. The Department of Health and Aged Care also liaised with representatives of general practitioners to inform them of the campaign. The campaign was advertised through television, radio and print media, as well as through various health care publications.

Implementation

School vaccination clinics were held from 3 August to 27 November 1998 in NSW. The NSW Department of Health contacted schools to arrange the clinics. The NSW Measles Immunisation Coordinator organised the clinics in the metropolitan, Central Coast and Hunter Area Health Services. Immunisation coordinators of the remaining rural Areas organised local clinics.

Teams of two (or more in some rural Areas) registered nurses, generally assisted by a clerk, ran the clinics. The nurses were recruited especially, or in rural Areas diverted from other duties, to hold the school vaccination clinics. All nurses were accredited to immunise in NSW. The clerks were recruited for the campaign and given special training.

The NSW Department of Health asked public hospitals to act as depots for the storage of the MMR vaccine and other equipment. At the beginning of each clinic day, the team leader collected these materials from the nearest hospital and returned the waste at the end of the clinic.

The nurses treated children who had reactions to the vaccination, referred any child who required further treatment to the local hospital, and recorded all reactions. Suspected adverse events were reported to the NSW Measles Immunisation Coordinator, who forwarded the information to the Commonwealth.

Data collection and analysis

Data was collected for each school. The clerk recorded the number of children, the number with consent forms, the number with consent, and the number vaccinated for each class, on school statistics forms. The forms were faxed to the NSW Measles Immunisation Coordinator at the NSW Department of Health where the data was entered into the EpiInfo database.

All primary school children who were eligible to be vaccinated in the school clinics and for whom data were available were included in the analysis. Children in their last year at rural primary schools and who were vaccinated earlier in the year were not eligible for this campaign. The total number of enrolments was obtained directly from the schools. Schools for which data were not available were contacted to ensure that a clinic had been offered. The number of children attending the schools that declined to participate was not available.

The data for each Area Health Service were analysed and compared to NSW totals using 95 per cent confidence intervals.

TABLE 5

THE NSW MEASLES CONTROL PROGRAM 1998: NUMBER AND PERCENTAGE OF CHILDREN VACCINATED AT NSW PRIMARY SCHOOL CLINICS IN 1998, BY AREA HEALTH SERVICE

Area Health Service	No. of primary school children	No. of forms returned	No. with consent for vaccination	No. of children vaccinated at school clinic	% of total students vaccinated
Central Sydney	34,530	32,172	27,494	26,177	75.8
Northern Sydney	62,175	57,997	47,868	45,565	73.3
South Eastern Sydney	57,621	54,488	44,688	41,330	71.7
South Western Sydney	82,836	77,149	63,481	59,672	72.0
Wentworth	34,749	31,505	24,189	23,252	66.9
Western Sydney	67,884	63,557	51,732	50,018	73.7
Central Coast	29,149	26,462	22,285	21,005	72.1
Far West	5,280	4,883	4,787	4,675	88.5
Greater Murray	28,019	26,564	24,584	23,450	83.7
Hunter	55,680	53,515	46,199	43,508	78.1
Illawarra	31,993	29,620	25,353	23,656	73.9
Macquarie	10,932	10,414	9,848	9,572	87.6
Mid North Coast	28,295	26,700	23,574	22,085	78.1
Mid Western	18,181	17,746	16,252	15,172	83.4
New England	19,856	18,507	17,723	17,179	86.5
Northern Rivers	26,515	23,911	20,590	19,259	72.6
Southern NSW	18,156	16,696	15,925	14,994	82.6
NSW TOTAL	611,851	571,886	486,572	460,569	75.3

RESULTS

Vaccination coverage

Clinics were held for 98.2 per cent (2503 schools) of the 2550 primary schools in NSW. Of the 47 schools that did not have clinics, 24 schools declined the offer of a clinic and a clinic was inappropriate for another 22 schools (they were attached to detention centres or hospitals, or were special schools where children attended temporarily). One school was not offered a clinic during the campaign; it will be offered a clinic in 1999.

For the 2503 participating schools, MMR vaccine was offered to 611,851 eligible primary school children at school clinics. The parents of 571,886 children (93.5 per cent) returned the forms to the class teachers and gave consent for 486,572 children (79.5 per cent) to participate (Tables 5 and 6). There were 460,569 (75.3 per cent) children vaccinated at the school clinics. The remaining children were not vaccinated due to absence, illness or refusals by the child.

Vaccination coverage was higher in the rural Areas (average of 78.9 per cent) than in the metropolitan Areas (average of 72.4 per cent).

Adverse event following immunisation

Based on the *Australian Immunisation Handbook* (6th edition) criteria for adverse events following immunisation (AEFI),[4] nine AEFIs were reported as being related to the school vaccination clinics—five cases of anaphylaxis, two of convulsions, an urticaria reaction and a rubella-like illness (the latter two required hospitalisation). Most events occurred in the first seven weeks of the campaign.

The AEFI rate was 2.0 per 100,000 injections for the 460,569 children vaccinated at school clinics. The rate for anaphylaxis was 1.1 per 100,000 injections and for convulsions was 0.4 per 100,000 injections.

In addition, three children were treated in accident and emergency centres for syncope and another child for a head injury sustained while fainting after the vaccination. A further five cases of rubella-like illness and one case of parotitis occurred within one to two weeks of receiving MMR vaccine. All children recovered.

Discussion

The Measles Control Campaign in NSW succeeded in vaccinating 75.3 per cent of primary school students through school clinics. Area Health Service immunisation coordinators were actively involved, especially in the rural Areas, and assisted the NSW Measles Immunisation Coordinator to organise the campaign.

Only the percentage of primary school children vaccinated at the school clinics could be calculated during the

TABLE 6

THE NSW MEASLES CONTROL PROGRAM 1998: PERCENTAGE OF CHILDREN WITH RETURNED FORMS, CONSENT, AND WHO WERE VACCINATED IN NSW, BY AREA HEALTH SERVICE

Area Health Service	% of forms returned	% total children with consent	% of total students vaccinated	% of returned forms giving consent	% of children with consent, who were vaccinated at the clinics
Central Sydney	93.2	79.6	75.8	85.5	95.2
Northern Sydney	93.3	77.0	73.3	82.5	95.2
South Eastern Sydney	94.6	77.6	71.7	82.0	92.5
South Western Sydney	93.1	76.6	72.0	82.3	94.0
Wentworth	90.7	69.6	66.9	76.8	96.1
Western Sydney	93.6	76.2	73.7	81.4	96.7
Central Coast	90.8	76.5	72.1	84.2	94.3
Far West	92.5	90.7	88.5	98.0	97.7
Greater Murray	94.8	87.7	83.7	92.5	95.4
Hunter	96.1	83.0	78.1	86.3	94.2
Illawarra	92.6	79.2	73.9	85.6	93.3
Macquarie	95.3	90.1	87.6	94.6	97.2
Mid North Coast	94.4	83.3	78.1	88.3	93.7
Mid Western	97.6	89.4	83.4	91.6	93.4
New England	93.2	89.3	86.5	95.8	96.9
Northern Rivers	90.2	77.7	72.6	86.1	93.5
Southern NSW	92.0	87.7	82.6	95.4	94.2
NSW	93.5	79.5	75.3	85.1	94.7

N.B. Data are approximations based on interpretation of the forms available from the school clinics. The percentages are based on Table 1.

Measles Control Campaign. The number of children vaccinated through their usual immunisation provider was not available; hence, the total vaccination coverage of all children during the campaign could not be calculated, but was undoubtedly higher. However, 94.7 per cent of children with written consent were vaccinated at the school clinics.

The rate of 1.1 per 100,000 doses for anaphylaxis after the MMR vaccine at school clinics was similar to that of one per 100,000 injections of measles–rubella vaccine reported in the measles–rubella immunisation campaign in the United Kingdom.[5] The other adverse events cannot be compared because the UK information was not available or because definitions differed.

In summary, the Measles Control Campaign in NSW was considered successful with 75.3 per cent primary school students vaccinated at school clinics.

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