



## MOTIVATING LOCAL ACTION ON POOL DROWNINGS: A BLACK SPOT APPROACH FOR NSW

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**T**his article reports the most recent available NSW data on drowning and near-drowning of toddlers (aged 0-4 years) by Local Government Area. The data identify "black spots" and are intended to assist local government in determining priorities for remedial action.

### BACKGROUND

#### NSW Health Goals and Targets for the prevention of drowning

The drowning of toddlers (aged 0-4 years) in private swimming pools raises emotive debate and community conflict<sup>1</sup>. The NSW Health Goals and Targets identify preventing toddlers from drowning and preventing near-drowning incidents as priorities<sup>2</sup>. They propose a 50 per cent reduction in toddler drowning and near-drowning incidents by 2000. Private swimming pools are the single most dangerous water environment for this age group. Drowning in swimming pools accounted for at least two-thirds of all drowning in the 0-4 age group during 1991-1993. The target would be achieved if all drownings in private swimming pools could be prevented.

The effective prevention of drowning requires monitoring of near-drowning incidents as well as deaths from drowning, but the causes of drowning and near-drowning may differ. Some toddlers involved in near-drowning incidents will have permission from adult supervisors to be in or around a pool, whereas most drownings occur after unintended access to a pool. Thus the major preventive actions available to reduce serious immersions are:

- appropriate supervision of children who have permission to be at the poolside; and
- pool fencing to protect toddlers who make their way unsupervised and without permission to a backyard pool.

#### Legislation and regulation

On August 1, 1992 the NSW Swimming Pools Act 1992 replaced legislation which had been passed in 1990. The new Act removed the retrospective requirement for all existing private pools to have isolation fencing. The legislation requires that any pool built after August 1, 1990 be surrounded by a child-resistant barrier that separates the pool from any residential building on the premises and from any place adjoining the premises. Pools built before that date must be surrounded by a child-resistant barrier that separates the pool from any adjoining premises.

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## Local action on pool drownings

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The Pool Fencing Advisory Committee was set up under the Swimming Pools Act 1992 within the Department of Local Government and Co-operatives. The committee is to consider data on drowning and near-drowning, both past and present, analyse the data and advise and make recommendations to the Minister on appropriate amendments to the Act regarding fencing legislation.

The committee has recommended that:

- a single, agreed minimum set of standard data be collected on all private pool drowning and near-drowning in NSW;
- a regular survey or inspection program of private pools be undertaken to collect information on the number of private pools, including data on fencing configuration, pool owner and frequency of child visitors to the residence; and
- a special study be supported to provide definitive answers concerning the protective value of pool fencing<sup>3</sup>.

Local councils are responsible for regulation and for the enforcement of the Act. There has been no statewide evaluation of the effectiveness of the legislation and no assessment of where the most serious immersions take place or where toddlers are at greatest risk.

### METHOD

Data sources for this study comprised:

- the NSW Inpatient Statistics Collection (ISC) for the 1986 calendar year and financial years 1988-89 – 1993-94; and
- Australian Bureau of Statistics (ABS) mortality data for 1979-1992.

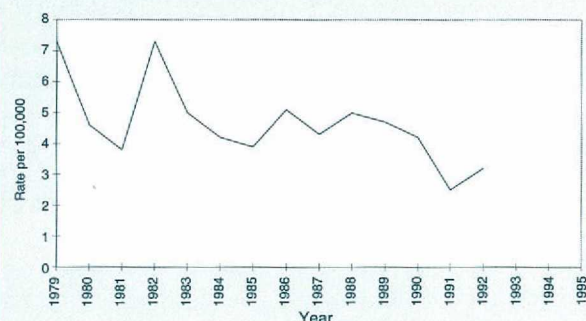
Only incidents classified as swimming pool immersions (E910.8 in the International Classification of Diseases and Causes of Death, version 9, Clinical Modification) were included. Indirect standardised rates were calculated to allow for changes in population structure over the period studied, with 1991-92 taken as the reference year for ISC data and 1991 for ABS mortality data.

Because pool immersion incidents in Local Government Areas (LGAs) are rare, it was necessary to combine data from several years to assess possible changes from a baseline. Deaths and hospital separations from 1986 and 1989-92 were combined to produce rates of serious immersions (i.e. near-drownings) of toddlers. To avoid double counting of a serious immersion, patients who subsequently died or were transferred from another hospital were removed from the ISC data. The remaining records from deaths and ISC data were considered a *serious immersion in a swimming pool (SI)*.

Indirectly standardised serious immersion ratios (SSIR) were calculated for each LGA. The standardisation of the data was adjusted for differences in the sex distribution (there was only one age group under examination) between the State population and the LGA population. Conventional 99 per cent confidence intervals were calculated for each

FIGURE 1

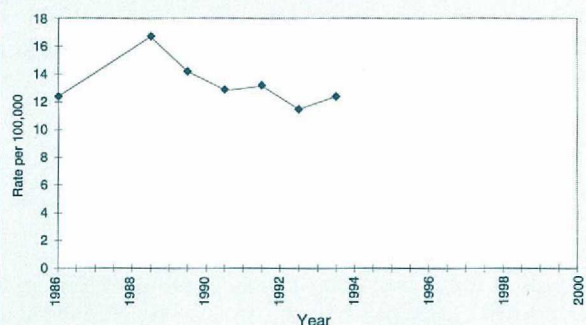
DEATHS BY IMMERSION IN SWIMMING POOLS BY 0-4 YEAR OLDS, NSW, 1979-1992



Source: Australian Bureau of Statistics: ICD9-CM E910.8

FIGURE 2

NSW HOSPITAL SEPARATIONS FOR IMMERSIONS IN SWIMMING POOLS FOR 0-4 YEAR OLDS, 1986 – 1993-94



Source: Inpatient Statistics Collection, ICD9-CM E910.8'

1. Separations as a result of death are also included.

SSIR based on the Normal Approximation Method, and the SSIR for the State as a whole was taken as 100 (thus an LGA with a SSIR of 300 would have a rate three times the State average).

### RESULTS

There was a marked reduction in mortality associated with drowning between 1979 and 1992. The numbers of deaths of toddlers from drowning in swimming pools declined from 29 (7.3/100,000) in 1979 to 14 (3.2/100,000) in 1992 (Figure 1).

By contrast, there was little change in the incidence of near-drowning among toddlers in swimming pools between 1986 and 1993-94, as indicated by hospital separations for immersion recorded in the ISC between 1986 and in 1993-94 (Figure 2).

Table 1 lists the cumulative SSIR for each LGA over the period 1986 and 1989-1992. In many LGAs no SI incidents

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TABLE 1

STANDARDISED SERIOUS IMMERSION RATIOS BY  
LOCAL GOVERNMENT AREA, NSW, 1986, 1989-1992

LGA	SI	EXP SI	SSIR	SSIR SE	LCI99	UCI99
Albury	1	2.6802	37.311	37.311	0.0	133.57
Armidale	-	1.3035	-	-	-	-
Ashfield	-	1.9043	-	-	-	-
Auburn	2	3.2196	62.119	43.925	0.0	175.44
Ballina	1	1.5397	64.948	64.948	0.0	232.51
Balranald	-	0.2115	-	-	-	-
Bankstown	8	8.8485	90.411	31.965	7.94	172.88
Barraba	-	0.1502	-	-	-	-
Bathurst, Evans and Oberon	1	2.3839	41.950	41.950	0.0	150.18
Baulkham Hills	5	6.1680	81.063	36.253	0.0	174.60
Bega Valley	1	1.7942	55.734	55.734	0.0	199.53
Bellingen	-	0.8215	-	-	-	-
Berrigan	1	0.5244	190.707	190.707	0.0	682.73
Bingara	-	0.1280	-	-	-	-
Bland	1	0.4919	203.285	203.285	0.0	727.76
Blue Mountains	4	4.8361	82.712	41.356	0.0	189.41
Bogan	-	0.2414	-	-	-	-
Bombala	-	0.2085	-	-	-	-
Boorowa	-	0.1707	-	-	-	-
Botany	2	1.8212	109.816	77.651	0.0	310.16
Bourke	-	0.3966	-	-	-	-
Brewarrina	-	0.2337	-	-	-	-
Broken Hill	1	1.5136	66.067	66.067	0.0	236.52
Burwood	1	1.3756	72.694	72.694	0.0	260.24
Byron	1	1.4620	68.399	68.399	0.0	244.87
Camden	5	1.5203	328.883	147.081	0.0	708.35
Campbelltown	13	12.5347	103.712	28.765	29.50	177.92
Canterbury	2	8.1573	24.518	17.337	0.0	69.25
Carrathool	-	0.2541	-	-	-	-
Casino	-	0.7091	-	-	-	-
Central Darling	1	0.2561	390.459	390.459	0.0	1,397.84
Cessnock	3	2.9507	101.669	58.699	0.0	253.11
Cobar	-	0.4558	-	-	-	-
Coffs Harbour	4	3.1586	126.637	63.318	0.0	290.00
Conargo	-	0.1060	-	-	-	-
Concord	1	1.1636	85.940	85.940	0.0	307.67
Coolah	-	0.2663	-	-	-	-
Coolamon	-	0.2762	-	-	-	-
Cooma-Monaro	-	0.6380	-	-	-	-
Coonabarabran	2	0.4923	406.267	287.274	0.0	1,147.43
Coonamble	-	0.4236	-	-	-	-
Cootamundra	-	0.5467	-	-	-	-
Copmanhurst	-	0.2601	-	-	-	-
Corowa	-	0.4560	-	-	-	-
Cowra	1	0.7994	125.087	125.087	0.0	447.81
Crookwell	-	0.3106	-	-	-	-
Culcairn	-	0.2685	-	-	-	-
Deniliquin	-	0.5413	-	-	-	-
Drummoyne	-	1.4089	-	-	-	-
Dubbo	4	2.5029	159.817	79.908	0.0	365.98
Dumaresq	-	0.2376	-	-	-	-
Dungog	-	0.4732	-	-	-	-
Eurobodalla	-	1.5381	-	-	-	-
Fairfield	13	12.0454	107.925	29.933	30.70	185.15
Forbes	-	0.6796	-	-	-	-
Gilgandra	-	0.3443	-	-	-	-
Glen Innes	-	0.39624	-	-	-	-
Gloucester	1	0.29687	336.847	336.847	0.0	1,205.91
Gosford	9	8.22751	109.389	36.463	15.31	203.46
Goulburn	1	1.37627	72.660	72.660	0.0	260.12
Grafton	-	1.06051	-	-	-	-
Greater Lithgow	1	1.35315	73.902	73.902	0.0	264.57
Taree and Great Lakes	2	3.83812	52.109	36.847	0.0	147.17
Griffith	1	1.54382	64.774	64.774	0.0	231.89
Gundagai	-	0.27718	-	-	-	-
Gunnedah	1	0.95510	104.701	104.701	0.0	374.83



TABLE 1 (Continued)

STANDARDISED SERIOUS IMMERSION RATIOS BY  
LOCAL GOVERNMENT AREA, NSW, 1986, 1989-1992

LGA	SI	EXP SI	SSIR	SSIR SE	LCI99	UCI99
Gunning	-	0.15367	-	-	-	-
Guyra	-	0.35155	-	-	-	-
Harden	-	0.28235	-	-	-	-
Hastings	1	2.67231	37.421	37.421	0.0	133.97
Hawkesbury	5	4.09056	122.233	54.664	0.0	263.27
Hay	-	0.27803	-	-	-	-
Holbrook	-	0.18276	-	-	-	-
Holroyd	6	4.81057	124.725	50.919	0.0	256.10
Hornsby	10	7.49788	133.371	42.176	24.56	242.18
Hume	-	0.44031	-	-	-	-
Hunter's Hill	4	0.47912	834.872	417.436	0.0	1,911.86
Hurstville	2	3.22824	61.953	43.808	0.0	174.98
Inverell	-	1.06084	-	-	-	-
Jerilderie	-	0.13562	-	-	-	-
Junee	1	0.37276	268.270	268.270	0.0	960.41
Kempsey	3	1.68985	177.530	102.497	0.0	441.97
Kiama	-	1.03820	-	-	-	-
Kogarah	2	2.24460	89.103	63.005	0.0	251.66
Ku-ring-gai	19	4.22498	449.706	103.170	183.53	715.88
Lachlan	-	0.60387	-	-	-	-
Lake Macquarie	13	9.99383	130.080	36.078	37.000	223.16
Lane Cove	2	1.35376	147.737	104.466	0.0	417.26
Leeton	1	0.74351	134.496	134.496	0.0	481.50
Leichhardt	-	2.66002	-	-	-	-
Lismore and Kyogle	2	3.33978	59.884	42.345	0.0	169.13
Liverpool	15	6.95351	215.719	55.698	72.02	359.42
Lockhart	2	0.27016	740.301	523.472	0.0	2,090.86
Maclean	1	0.72687	137.576	137.576	0.0	492.52
Maitland	3	3.35932	89.304	51.560	0.0	222.33
Manilla	-	0.20894	-	-	-	-
Manly	3	1.65224	181.571	104.830	0.0	452.03
Marrickville	2	4.24056	47.164	33.350	0.0	133.21
Merriwa	-	0.16872	-	-	-	-
Moree Plains	1	1.39580	71.644	71.644	0.0	256.48
Mosman	-	1.10127	-	-	-	-
Mudgee	1	1.14282	87.503	87.503	0.0	313.26
Mulwaree	-	0.36092	-	-	-	-
Murray	-	0.31277	-	-	-	-
Murrumbidgee	-	0.17532	-	-	-	-
Murrurundi	-	0.15325	-	-	-	-
Muswellbrook	1	1.20935	82.689	82.689	0.0	296.03
Nambucca	2	1.04373	191.620	135.495	0.0	541.20
Narrabri	3	1.06330	282.139	162.893	0.0	702.40
Narrandera	-	0.49983	-	-	-	-
Narromine	-	0.50334	-	-	-	-
Newcastle	9	6.89363	130.555	43.518	18.28	242.83
North Sydney	1	1.4947	66.902	66.902	0.0	239.51
Nundle	-	0.0836	-	-	-	-
Nymboida	2	0.3033	659.404	466.269	0.0	1,862.38
Orange, Blayney and Cabonne	3	3.4488	86.987	50.222	0.0	216.56
Parke	-	0.9773	-	-	-	-
Parramatta and Blacktown	20	24.1454	82.832	18.522	35.05	130.62
Parry	-	0.7708	-	-	-	-
Penrith	20	12.3338	162.156	36.259	68.61	255.70
Port Stephens	1	3.0208	33.104	33.104	0.0	118.51
Queanbeyan	2	1.7682	113.112	79.982	0.0	319.47
Quirindi	-	0.3502	-	-	-	-
Randwick	5	4.8066	104.024	46.521	0.0	224.05
Richmond River	-	0.5811	-	-	-	-
Rockdale	3	4.1492	72.304	41.745	0.0	180.00
Ryde	4	4.8262	82.881	41.440	0.0	189.80
Rylstone	-	0.2545	-	-	-	-
Scone	1	0.6700	149.265	149.265	0.0	534.37
Severn	-	0.1982	-	-	-	-
Shellharbour	7	3.3704	207.688	78.499	5.16	410.21
Shoalhaven	3	4.4998	66.670	38.492	0.0	165.98



**TABLE 1 (Continued)**
**STANDARDISED SERIOUS IMMERSION RATIOS BY  
LOCAL GOVERNMENT AREA, NSW, 1986, 1989-1992**

LGA	SI	EXP SI	SSIR	SSIR SE	LCI99	UCI99
Singleton	2	1.4171	141.137	99.799	0.0	398.62
Snowy River	-	0.3156	-	-	-	-
Strathfield	-	1.1850	-	-	-	-
Sutherland	10	11.3625	88.009	27.831	16.21	159.81
Tallaganda	-	0.1535	-	-	-	-
Tamworth	2	2.3210	86.170	60.931	0.0	243.37
Temora	1	0.4399	227.339	227.339	0.0	813.87
Tenterfield	1	0.4315	231.773	231.773	0.0	829.75
Tumbarumba	-	0.2636	-	-	-	-
Tumut	-	0.7766	-	-	-	-
Tweed	7	3.1256	223.957	84.647	5.57	442.35
Ulmarra	2	0.4230	472.850	334.356	0.0	1,335.49
Uralla	-	0.4113	-	-	-	-
Urana	-	0.1148	-	-	-	-
Wagga Wagga	3	3.7499	80.001	46.189	0.0	199.17
Wakool	-	0.3558	-	-	-	-
Walcha	-	0.2407	-	-	-	-
Walgett	1	0.5932	168.576	168.576	0.0	603.50
Warren	-	0.2735	-	-	-	-
Warringah	10	8.8529	112.958	35.720	20.80	205.12
Waverley	-	2.4620	-	-	-	-
Weddin	-	0.2726	-	-	-	-
Wellington	2	0.6559	304.907	215.602	0.0	861.16
Wentworth	1	0.4731	211.378	211.378	0.0	756.73
Willoughby	1	2.5954	38.529	38.529	0.0	137.93
Windouran	-	0.0293	-	-	-	-
Wingecarribee	-	2.2409	-	-	-	-
Wollondilly	2	2.4368	82.074	58.035	0.0	231.80
Wollongong	11	10.5743	104.026	31.365	23.10	184.95
Woollahra	-	1.6555	-	-	-	-
Wyong	8	6.6564	120.185	42.492	10.56	229.81
Yallaroi	2	0.2434	821.585	580.948	0.0	2,320.43
Yarrowlumla	-	0.5386	-	-	-	-
Young	1	0.7152	139.829	139.829	0.0	500.59

**Abbreviations**

LGA = Local Government Area

SI = Serious Immersions (includes deaths and hospital separations)

Exp SI = Expected number of serious immersions

SSIR = Standardised Serious Immersion Ratio

SSIR SE = Standardised Serious Immersion Ratio Standard Error

LCI99 = Lower 99% confidence interval

UCI99 = Upper 99% confidence interval

**TABLE 2**
**SERIOUS IMMERSIONS FOR 0-4 YEARS BY  
LOCAL GOVERNMENT AREA, NSW, 1986, 1989-1993**

Local Government	1986-92*				1993			
	SI	Exp SI	Total Pop	Rate <sup>‡</sup>	SI	Exp SI	Pop	Rate
Campbelltown	13	12.5	76,636	17	2	1.9	15,398	13
Canterbury	2	8.2	49,839	4	-	1.2	10,052	-
Gosford	9	8.2	49,895	18	1	1.3	10,684	9.4
Ku-ring-gai	19	4.2	25,984	73	-	0.6	4,941	-
Parramatta/Blacktown+	20	24.0	146,492	14	2	3.8	30,674	6.5
Lake Macquarie	13	10.0	61,160	21	4	1.5	12,330	32.4
Marrickville	2	4.2	26,075	8	-	0.6	5,054	-
Penrith	20	12.3	75,843	26	5	1.8	14,728	33.9
Sutherland	10	11.2	68,468	15	1	1.7	14,015	7.1
Tweed	7	3.1	18,246	38	2	0.5	4,049	49.4
Warringah	10	8.9	54,293	18	4	1.3	10,711	37.3
Wyong	8	6.7	39,687	20	5	1.1	8,907	56.1
<b>State total</b>	<b>346</b>	<b>346</b>	<b>2,120,865</b>	<b>16</b>	<b>54</b>	<b>54</b>	<b>436,497</b>	<b>12.4</b>

SI = Serious Immersion (includes deaths and hospital separations), Exp SI = Expected number of serious immersions, Pop = Population

\* No data from 1987 and 1988 were used due to incomplete Inpatient Statistics Collection.

‡ Crude rate per 100,000 population.

+ Parramatta and Blacktown are combined because of boundary changes.



## Local action on pool drownings

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occurred during this period. Of those where at least one SI occurred, Canterbury had the lowest incidence in relation to the State average. Only Ku-ring-gai LGA had a significantly higher rate than the State average, with 15 more incidents than expected over five years.

SIs in 13 LGAs were examined in more detail (Table 2). These LGAs were selected because of the number of SIs that occurred in them, or because they had substantial populations aged 0-4 years. During 1986-1992 these LGAs accounted for 35 per cent of all SIs and 33 per cent of the State's population aged 0-4 years. Although death data for 1993 were possibly incomplete, there were higher numbers of SIs than expected in the Lake Macquarie, Penrith, Tweed, Wyong and Warringah LGAs.

The Ku-ring-gai area averaged about three SIs a year in 1986-1992 – similar to the number of SIs in Parramatta and Blacktown LGAs, which had a combined population 5-6 times larger. There were no SIs in the Ku-ring-gai LGA in 1993, while there were five SIs in the Wyong LGA – twice as many as in the Parramatta LGA but with less than one-third the population aged 0-4 years.

### DISCUSSION

The differences among LGAs in SI rates may have resulted from several factors, including differences in the numbers of pools among LGAs (and therefore the amount of exposure), and variations in fencing configurations or the degree to which the legislation was enforced. Unfortunately, we do not have sufficient information to confirm or refute these possibilities.

The objective of this report was to identify "black spots" – LGAs with an excess of serious immersions of toddlers – which could motivate local prevention efforts. These efforts could complement (not replace) Statewide campaigns aimed at increasing compliance with pool fencing legislation and parental education about cardiopulmonary resuscitation, the causes of serious immersions and the need for vigilance.

The concept of statistical significance with 99 per cent confidence may be inappropriate when the number of incidents in a local area is few. Lower levels of confidence may be more acceptable and appropriate to determine possible black spots.

Alternatively, if the State target of a 50 per cent reduction from a baseline rate is considered acceptable, an assessment of the number of events in excess of this rate may provide a practical approach. However, if there is a community demand to prevent all drownings or near-drowning incidents in swimming pools in the 0-4 age group, every event should be investigated at a local level.

The Mental Health Epidemiology Group has suggested this approach in relation to suicides. It involves local auditing of the events that led to each suicide death or attempt<sup>4</sup>, with an emphasis on immediate local action, rather than waiting for sufficient numbers of incidents to occur for statistical analysis. *Auditing* is defined as the collecting of information to promote or enforce positive change. Timeliness is an essential component of any audit process.

There is no adequate process of auditing serious immersions at a local level. As recommended by the Pool Fencing Advisory Committee<sup>3</sup>, the establishment of a drowning and near-drowning register that led to an immediate response, an assessment of the factors and events leading up to the incident and subsequent action at local and State levels in response to the contributing factors, would improve our understanding of the causes of serious immersions and increase the likelihood of reducing their number.

The information to be collected on private pools, also recommended by the Pool Fencing Advisory Committee<sup>3</sup>, would help determine the reasons for the variations in rates among LGAs. A review of local government approaches to the enforcement of pool fencing legislation could be related to population rates over time, and this could help to explain the varying temporal trends.

### ACKNOWLEDGMENT

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