A DESCRIPTIVE STUDY OF CHILDHOOD DROWNING IN WESTERN AUSTRALIA: 1987 - 1996

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September 1998

Sponsored by Healthway and The Royal Life Saving Society of Australia

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EXECUTIVE SUMMARY

The prevention of drownings and near drownings in children under five years is a continuing priority in Western Australia. Based on other descriptive studies and past research, nationally and internationally, a number of potential risk factor have been identified. The Royal Life Saving Society of Australian commissioned WA to undertake a descriptive study to identify the factors which contribute to an immersion incident among Western Australian children under five years of age.

Raw data from the Australian Bureau of Statistics records and coronial reports was analysed used to support or question the relevance of previously identified causal factors for Western Australian children. Some previously unidentified potential risk factors were also highlighted. A number of recommendations are included based on the results of this study, the Brisbane Drowning Study, and the Report of the Inter-Government Working Party on Swimming Pool Safety.

The multiple causes of drowning are age and location related. Children under 12 months are more likely to drown in bathtubs, while children of one to two years are more likely to drown in swimming pools. Children two to four years predominantly drown in open water hazards. Male children are consistently over-represented in all drowning incidents.

The main contributing factor in the majority of childhood drowning incidents appears to be access to swimming pools without fencing or with inadequate fencing. Where as lack of adequate adult supervision is the main causal factor for all other childhood drownings. In the majority of identifiable cases the child was clothed at the time of immersion, suggesting that the child's play was inadequately supervised.

The majority of drowning incidents occur in the summer months, between 4pm and 6pm or during periods of peak domestic activity. Rural children drown at a rate three times greater than that of metropolitan children; however this uniformly high rate across the state does exclude climate as a causal factor. The casualty is usually a resident, friend, relative or invited guest at the location of the drowning incident.

Aboriginal children drown at a rate two and one half times that of non-Aboriginal children. This is reported to occur mainly in rural and natural water hazards. Inadequate supervision was identified as the causal factor in all immersion incidents involving Aboriginal children.

The relationship between family size, parental age and water familiarisation remains inconclusive due to the small numbers reviewed. There is some evidence from the Brisbane Drowning Study that children of larger families are at a greater risk of drowning, although the larger family is the exception rather then the norm in this study. There is no conclusive evidence available at this stage to suggest that children under three years of age are less likely to drown after participating in water familiarisation classes.

The standard of swimming pool fencing is also reported to influence the incidence of drowning or near drowning in children under five years. Generally it was expected that the standard of pool fencing would be relative to the year of installation. With the

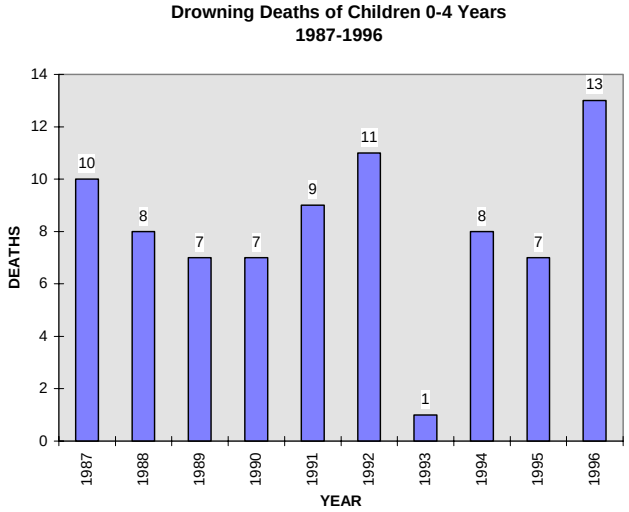
exception of one swimming pool in the study, all swimming pools were installed prior to 1992. In 47% of cases the swimming pool fencing failed to adhere to standards appropriate to the time of installation or standards were met but the fencing was faulty or in need of repair. In the remaining cases entry to the swimming pool was gained directly from the dwelling.

This study concludes that drowning or near drowning in children under five years in swimming pools can be reduced by the mandatory installation of isolation fencing and self-closing gates for all new and existing swimming pools. The author strongly supports an active role in preventing swimming pool drownings by encouraging the Pool Inspection Program conducted by the Royal Life Saving Society of Australia. In addition, a drowning prevention campaign is recommended to provide an educational program to focus on the importance of constant adult supervision when children are in the bathtub or in proximity to any open water hazard.

1.0 INTRODUCTION

Of the three leading causes of childhood deaths from injuries, drowning ranks second or third in most countries for children aged 0-4 years. An international comparison of drowning rates (appendix I) indicates that Australia has the second worst record in the world for toddler drowning. Drowning is the most common cause of accidental death in Australian children between 0-4 years. For every child between 0-4 years who drowns another 4-10 children will be admitted to hospital following a serious immersion incident.[1, 15, 19] In Western Australia (WA), 81 children aged 0-4 years drowned between 1987 and 1996 (Figure 1), 54% of these drownings occurred in backyard swimming pools.[2]

Figure 1.



Source: ABS Data 1987-1996

In WA, between 1975-1986, an average of 13.5 children between the ages of 0-4 years drowned annually.[3, 14] From 1987 to 1996 (Figure 1) the yearly average reduced to 7.9 drowning deaths for 0-4 year olds. Private swimming pool drownings increased as a percentage total of all drownings from 38%[4] in 1986 to 56% in 1996. Although yearly fluctuations are apparent. Before making any assumptions from this data it should be noted that certain difficulties arise and need to be taken into consideration when making comparisons of trends over time:[5]

- difficulty in finding accurate and comparable data;
- a wide variation in drowning rates from year to year;
- an apparent trend over a ten year period which may be different when observed over a 20 or 30 year period.

It is clear that, the frequency of accidental drowning has declined in every age group except children younger than five years where the figure remains more than three times the national average for all age groups.[6] The same pattern is highlighted in international literature.[15, 16]

Children 0-4 years are most likely to drown in backyard swimming pools. The predominance of backyard pool drownings may be attributable to an increase in private pool ownership in WA from an estimated 47 800 in 1988, to 80 000 in 1996.[2,

[4, 5] As well as swimming pools, all unprotected bodies of water (buckets, baths, rivers, dams, washing machines, drains, and garden ponds) pose a risk to this vulnerable age group.

The loss of life in Australian children is a significant problem that requires detailed analysis. Data allow examination of trends in drowning incidents to identify demographic and geographical factors. However, by incorporating detailed coronial reports, an attempt has been made to identify contributing factors and common trends that currently lead to the occurrence of serious immersion incidents. Epidemiological data is compared with relevant descriptive studies conducted by other organisations and individuals.

2.0 METHODS

Data

Raw data used to determine drowning numbers were obtained from vital statistical records. Total drowning numbers over the period 1987-1996 were obtained from the Australian Bureau of Statistics (ABS) record files of mortality data. All drownings as described by the International Classification of Disease codes (ICD - 9) for children 0-4 years were also included.

This information was cross referenced with coronial reports matching age, gender, date of death, and race. A total of 68/81 (83%) drowning reports for the 1987-1996 period were accessed and reviewed. The remaining files were held in regional coronial offices, making access financially and logistically impractical.

Variables

Fifteen variables were examined to determine factors that significantly contributed to the occurrence of a drowning incident.

The variables are listed below:
gender, age, race, month, time, statistical division, own home/other, water hazard, type of fencing, supervision, clothing, water familiarity, parental age, family size, floating objects, pool construction/age, and activities prior to immersion incident.

3.0 RESULTS

3.1 Gender

The number of drownings in WA for male and female children aged 0-4 years over the period 1987-1996 totalled 81, males accounted for 53 deaths (65%) while females accounted for 28 deaths (35%). Male children were consistently over represented except in 1996 when only six male children drowned compared to seven female children. Of the 68 coronial reports examined, male children represented 63% consistent with the ABS figure of 65%.

3.2 Age

The 68 coronial reports studied between 1987-1996 indicate that children between 12 and 24 months of age were more likely to become a drowning fatality (see Table 1).

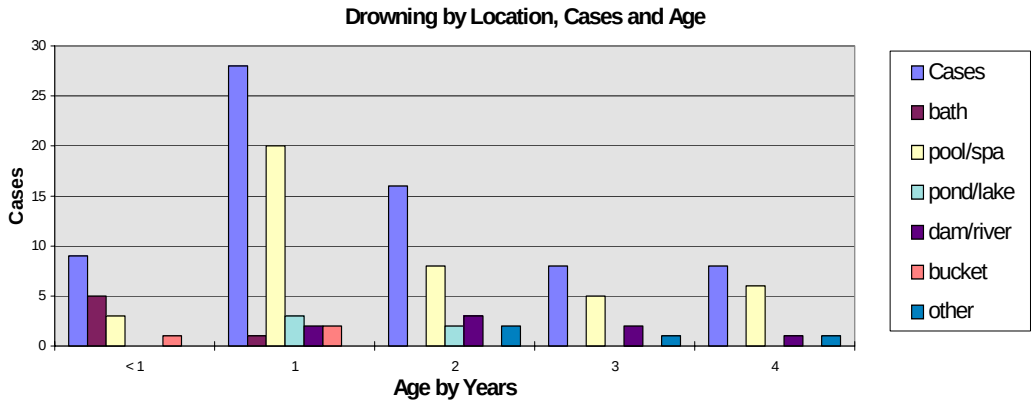
Table 1: ***Age of Children Drowned***

Age (years)	Number of coronial cases	Percentage of total cases
<1	9	13
1	28	41
2	15	22
3	8	13
4	8	11
Total	**68**	**100**

Source: WA Coronial Reports & ABS Data 1987-96

Of the 28 deaths, 19 (68%) occurred in backyard swimming pools, while the remaining nine (32%) were spread evenly between buckets, ponds, dams, and baths. Of the six children who drowned in bathtubs, all were under one year except one 16 month old child. The young children who drowned in buckets ranged from 9-16 months of age and were all mobile. Drowning incidents among 2-4 year olds are spread relatively evenly between ponds, dams and rivers, with the exception of backyard swimming pools which account for 19 (48%) deaths in this age category.

Figure 2.



Source: WA Coronial Reports 1987-1996

3.3 Race

Aboriginal children represented l5% of the drowning deaths for 0-4 year olds, an average of 1.2 per year from 1987-1996. (It should be noted that due to such small

numbers it is difficult to determine an accurate assessment of risk). Most of the Aboriginal children who drowned did so in rural or natural water hazards.

3.4 Season

The distribution of drowning by season/month in WA for 1987-1996 extracted from coronial reports is shown in Table 2. Children most frequently drowned in summer (41% of deaths studied) with the majority of cases occurring in January (n=13) and relatively few cases occurring in winter, June having the least number of recorded cases (n=2).

Table 2: ***Drowning Deaths for Age 0-4 years by Month***

Month	Number	% of total
January	13	19
February	8	12
March	8	12
April	3	4
May	4	6
June	2	3
July	4	6
August	5	7
September	5	7
October	5	7
November	4	6
December	7	11
TOTAL	**68**	**100**

Source: WA Coronial Reports, !987-1996

3.5 Time of Day

Thirty-one percent of drownings occurred between 4-6pm followed by 21% from 10am-12pm. Activities identified prior to the drowning incident included parent or carer preoccupation with attending to visitors or other children, meal preparation, or general domestic duties.

3.6 Geographical Location

Rural and Metropolitan

Forty-five percent of all drownings occurred in rural areas. Table 3 and Appendix III illustrate the rates for each statistical division in WA. The highest rates occurred in the Midlands followed by the Kimberley and Pilbara divisions. Of the 37 rural drowning incidents, five occurred in bathtubs, two in public pools, while the remainder were spread equally between private swimming pools and rural/ natural water ways.

Table 3: ***Drowning Deaths 0-4 years by Geographical Location***

Region	Deaths	Per 100 000
Kimberley	4	146
Pilbara	7	138
Midwest	3	56
Midlands	9	185
Great Southern	3	51
Goldfields	2	38
South West	9	78
Metropolitan	44	46

Source: ABS Data 1987-96 (n=81)

Metropolitan Perth has the lowest rate of all seven divisions. Children 0-4 years who lived in Perth's east metropolitan health division were three times more likely to drown than those in the north, and are five times more likely to drown than those in the south (appendix IV).

3.7 Own Home/Other

Eight- four percent of children 0-4 years who drowned were either resident or invited guest of a relative or family friend (see Table 4). It was rare (3%) for the child to be a trespasser. Both public pool drownings were classified as swimming pool/spa and the seven drownings which occurred in rural/natural water hazards outside property boundaries were also classified as '*other'*.

Table 4: ***Resident or Guest***

	Swimming Pool/spa	Bath/ Container	Rural/natural Water Hazard	Total
Resident	19	12	7	38 (56%)
Guest	18		1	19 (28%)
Outsider	2			2 (3%)
Other	2		7	9 (13%)

Source: WA Coronial Reports 1987-96

3.8 Water Hazards

Swimming pool/spa

Of the 68 coronial reports studied 61% of immersion incidents occurred in backyard swimming pools or spas either in the child's own home or at other people's homes as an invited guest. Only 7% of drowning incidents occurred in swimming pools where the children were outsiders.

In 75% of cases gates were faulty or open, fencing was defective, non-existent or consisted of perimeter fencing only. There is one recorded drowning incident where a properly secured pool resulted in a death (see Table 5). In this incident the point of entry was unknown.

Table 5: ***Most Likely Means of Access to Water Source***

Direct access to pool area from house	13
Gate open	8
Gate faulty	6
Public and wading pool	4
No pool fence	3
In care of older sibling in pool area	3
Climbed ladder to above ground pool	2
Defective pool fencing	1
Access Unknown	1

Source: WA Coronial Reports 1987-96

In the three drowning incidents involving public pools, the two main contributing factors were inadequate adult supervision or illegal entry to the pool area. In the three above ground pool drownings, access was gained by the pool ladder (two cases) and inappropriate garden terracing to within 10cm of the top of the pool rim (one case). One drowning incident was associated with a wading pool.

Baths and containers of liquid
Of the eight children (10%) who drowned in a bath, 62% of these five cases where aged less than one year. Of the eight cases, six coronial reports were retrieved. In two cases the infants were left unsupervised for two to five minutes (see Table 6).

Table 6: ***WA Bath Drowning Age 0-4 years***

Inadequate supervision	2
Care of older sibling	2
Unemptied bath	2

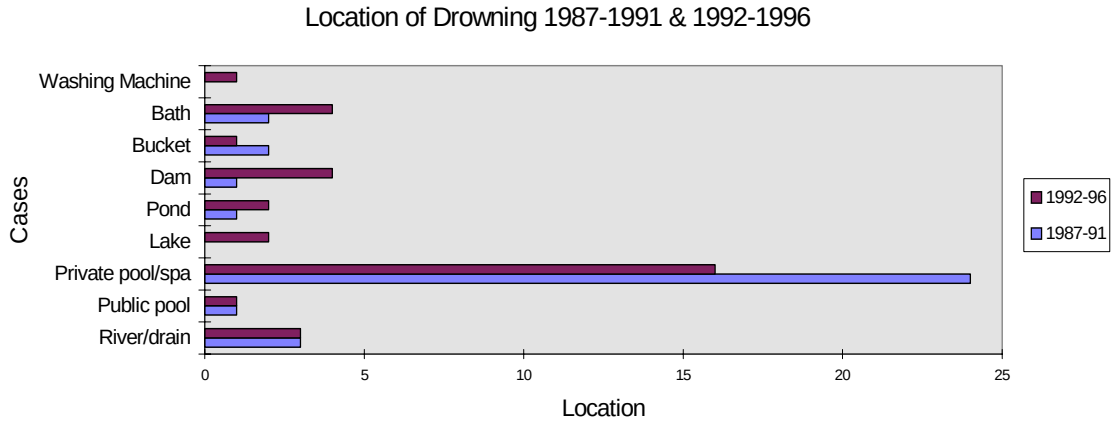
Source: WA Coronial Reports 1987-96

In two other drowning cases the children were left in the care of siblings who were no more than two and one half years of age. In one of these incidents the mother left the room briefly to collect towels. In the other, the children were left playing in the bath while the mother completed her housework. In the remaining two cases, bathtubs were left unemptied on a previous occasion and at some point filled by an older sibling in order to float toys.

Containers of liquid were identified from coronial data and accounted for 5% of drowning incidents. In 75% of cases, drownings occurred in containers where clothes were soaking (the majority being buckets >10L). No lids were present.

Rivers, Dams and Ponds
Sixteen (24%) immersion incidents occurred in the following types of locations: dams, rivers, creeks, wells, open tanks, post holes, irrigation channels and ponds. In correlation with other studies, 75% of the children were older than two years and 69% were male. Garden ponds accounted for only 4% of drowning incidents in toddlers between 12 and 18 months of age. The ponds involved were all uncovered and the toddlers were left alone to play in the backyard while the carer attended to domestic duties.

Figure 3



Source: WA Coronial Reports 1987-1996

3.9 Supervision
In 77% of identifiable cases from 1987-1996, the children were clothed at the time of immersion suggesting that they were not intended to be in the vicinity of the swimming pool. Of the six bathtub drownings, there were four cases where the child

was left unsupervised for two to five minutes. In the remaining two cases, the mother was unaware that the bathtub was filled with water when the child wandered out of sight to play in another area of the house. Three children drowned in buckets while the parent was busy in another room of the house. One child drowned in a washing machine while the family slept.

Coronial reports cited ponds, dams, rivers and creeks as the location of 16 drowning incidents. Two children drowned after wandering away from the house while the family slept, five children drowned when playing with other children without adult supervision, eight children drowned when playing alone in the backyard, and one child drowned when he fell into a fish pond while hiding from his mother behind a potted plant.

Forty swimming pool immersions were studied. Seven children were thought to be playing with or being supervised by older children. Thirty children entered a pool when their whereabouts were unknown to the parents or carers (a time period ranging from
5-30 minutes). In only three cases adults were directly supervising their child during which time the child entered the pool unnoticed and drowned.

3.10 Clothing

Coronial reports provided information about the child's attire at the time of death in 76% of cases. In 77% of cases the child was dressed (the minimum requirement for this classification was a nappy and singlet/t-shirt). In nearly all cases where the child was undressed, swimming or bathing had been the activity during or prior the immersion incident.

3.11 Insufficient Data

Swimming pool age, water familiarity, family size, parental age

Pool age was identified in 40% (n=16) of the coronial reports. Building by-laws have evolved over the past three decades and so the standard of private swimming pool fencing is generally contingent upon the year of installation.* In 12% (n=2) of cases no standards were adhered to for either fencing or gates. Thirty percent (n=5) of pools met standards appropriate to the time of construction but were faulty and in need of repair. Forty percent (n=6) consisted of perimeter fencing only allowing access via dwelling doors or windows. In 18% (n=3) of cases where local by-laws were met and fences/gates were in good working order, human error or lack of supervision were the main contributing factors in a drowning incident.

The information supplied on water familiarisation was generally anecdotal. Statements from police reports were usually of the nature *"…he/she couldn't swim without floaties and had been told not to go near the pool…"*. There were only three recorded cases where children were described as being *"used to playing in the pool"*, although it is unclear whether they had participated in any formal swimming lessons. In two

** In the period 1 July 1992 to 11 December 1993 the installation of isolation fencing for all new pools was mandatory. On 12 December 1993 the Building Regulations 1989 were amended to include perimeter fencing and security provisions for dwelling openings which provide access to the pool area.*

cases, both children were fully clothed and in another case the child was swimming with other children. In all cases there was no direct adult supervision.

Attempts were made to determine whether *family size* or *parental age* were significant factors in drowning incidents (this data was only included in some accompanying police reports). Family size ranged from 0-6 siblings with an average range of 1.4 and mode of 1.0. In three cases the child was a twin. Parental age ranged from 19-44 years with a mean of 29.5 years and mode of 30 years.

Data from the coronial reports identifies the presence of tempting objects in the water as a factor in 14% of immersion incidents.

4.0 DISCUSSION

In WA, male children are at greatest risk of drowning whether it be in backyard swimming pools and spas (58% males), or dams, ponds and rivers (68% males). In fact male children account for the majority of all injuries.[20] These results are in accordance with the national and international infant drowning trend of male prevalence.[6, 15, 17-19, 22] Male children consistently out number female children in swimming pool drownings, although the ratio varied from 54-69%.[5, 6] This trend is not so apparent in bathtub immersion incidents where male and female children are equally represented.[5]

The age and location of immersion incidences are inter-related.[4, 15, 19] Children 1-4 years are more likely to drown in backyard swimming pools, with young children of one and two years particularly at risk (see Table 1). Children under one year of age most frequently drown in bathtubs and buckets. Previous Australian studies have associated these drownings with large families, lower socio-economic status, or a change in family routine.[5] The variables listed above were also included in this study.

Although causes are multi-factorial, WA has a high rate of domestic pool ownership (approximately 80 000, ABS 1996) and a number of unprotected rural water hazards which increase an infant's likelihood of exposure to high risk environments.[7] Behavioural and developmental factors and an inability to swim are important considerations. A child of this age has limited strength, judgement and physical co-ordination, but a highly developed sense of curiosity with an absent or limited concept of danger.[5, 7, 19] Parents may have unrealistic expectations of a child's ability to avoid danger or demonstrate self-control. Documented cases in the Brisbane Drowning Study indicated that parents erroneously felt that the presence of older siblings or other children reduced the risk of drowning.[8]

The majority of drownings occur in the summer months suggesting that climate is a causal factor. Although a child's behaviour is unlikely to change with the seasons, access to water and parental attitude to water activities may differ between summer and winter months. The consistency of the pattern across climates is evident from other studies but has not been fully explained.[15, 19] Climate impacts on the location of drownings in the warmer areas of the USA, Australia, and South Africa the majority of drownings occurring in family swimming pools. In the colder climates in Australia and round the world (Canada, Great Britain) drownings tend to occur in natural bodies of fresh water.[17]

The coronial reports studied indicate that the majority of drownings (31%) occurred between 4-6pm followed by 21% from 10am -12pm. Few drowning studies to date have considered whether time of day is an indicator of increased risk of an immersion incident. Several contributing factors are apparent during these critical time blocks when parents and carers reported being preoccupied, attending to visitors, other children, meal preparation, or general domestic duties. The Brisbane Drowning Study identified 16 individual causes leading to immersion incidenys (appendix II).[5] *Vulnerable Period* for carers and parents were identified as number five in priority order. Generally a break in routine leading to *vulnerability* is identified as marital strife, illness, domestic arguments or visitors. This study tends to suggest busy periods rather than a break in routine is a greater contributing factor with only 11 of the 68 (16%) coronial reports indicating that a break in routine (visitors etc) had occurred. Activities prior to the drowning incident in the majority of cases involved everyday domestic duties. In the USA, drowning rates are highest at noon and 6pm, the peak time being late afternoon and early evening during meal preparation time.[15, 17] Western Australian Injury Surveillance Data illustrates a similar trend with injury rates peaking between 4pm and 6pm and children under five years being at greatest risk.[3, 14] Prevention strategies, therefore, need to include structural measures that can offer protection to young children when busy parents or carers are inevitably distracted.

The raw data shows that 45% of all drownings occur in rural areas while only 25% of the WA population resides outside the metropolitan area. Western Australian children 0-4 years living in the country are three times more likely to drown than those in the metropolitan area. The uniformly high drowning rate for children outside the metropolitan area, whether in the Kimberly or Wheatbelt, indicates that climate is not an important factor for this group. Contributing factors may include decreased access to emergency medical care and swimming pool by-laws which only apply to private pools within the town site of the municipality. **Private pools outside the town site are not required to comply with standard safety regulations.**[13]

Aboriginal children 0-4 years drown at a rate two and one half times that of non-aboriginal children. Prior to 1986 the drowning rate for aboriginal children had been half that of the non-aboriginal population.[7] Studies in the United States of America (USA) also found black children at higher risk of drowning than white.[17] This study and those in the USA identified ponds, lakes, ditches and other natural bodies of fresh water as the location of the majority of drowning incidents in Aboriginal and black American children.[17,19] Of the available coronial reports reviewed, lack of adult supervision appeared to be the main contributing factor in the child's death. However, as with many indigenous communities overall injury rates are higher than that for the general child population.[20]

Previous Australian studies have found that children from more advantaged families tend to be over represented in swimming pool fatalities, while bathtub drownings dominate disadvantaged groups.[9] By cross referencing the suburb of the immersion incident with the Index of Relative Disadvantage, children from areas with a lower score on the index were identified as being at greater risk from both swimming pool and bathtub drownings *"…the lower score on the index suggests the area has more low income families, more people with little training and in unskilled occupations."*.[10]

The relationship between socio-economic status and the risk of an immersion incident occurring is possibly multi-factorial. Private swimming pool ownership has significantly increased in the last ten years increasing the likelihood of a child being exposed to a pool. With improved technology, below ground pools have also become more affordable to a wider income group.[4] This may explain why private swimming pool drownings account for 38% of total drowning between 1975-1986, increasing to 56% of total drownings between 1987-1996.[4]

The majority of WA children 0-4 years who drowned were resident and in most cases were left unsupervised for only a few minutes. It is possible to postulate that adequate structural measures are in place to prevent young children gaining access to water hazards on other people's property or open public space. We do not know if parents or carers are more conscientious in their supervision of children when not in the confines of their own home or that of family or friends. Considerations such as these are important factors in the development of appropriate prevention strategies.

About half of all drownings in children aged 0-4 years occur in domestic swimming pools.[5, 15, 17, 19, 22] Current literature supports the belief that the absence of a safety barrier and reduced parental supervision are the most frequent factors identified in childhood drownings and near drownings. In 75% of WA backyard pool drownings from 1987-1996, gates were faulty or open, fencing was defective, non-existent or consisted of perimeter fencing only, enabling direct access from the house to the pool area. These results are consistent with other studies from Australia and USA which reported 60-90% of immersion incidents for children under five years occurring in swimming pools without fencing or an adequate barrier.[4, 11, 17, 19, 22] According to the Brisbane Study there were no cases of child drownings in an adequately fenced pool.[5]

The evidence suggests that a well maintained and properly used safety barrier isolating the pool area from the house and the children's play area significantly reduces the likelihood of a drowning incident. The Brisbane Drowning Study and this study identified a small number of cases where the child was left in the care of an older sibling with the parent having unrealistic expectations of the supervising child's ability to perceive danger and react in an appropriate manner.

A wading pool was cited in only one coronial report on drowning in the past ten years. However, they still remain a potential hazard if not emptied immediately after use or when children are not directly supervised by an adult.

All recent Australian studies identify bathtubs as the second most common site for childhood drownings with children under one year being at greatest risk. In the WA cases studied, the infants were left alone for short periods (2-5 minutes) in the care of a sibling, playing in the bath unsupervised, or the bathtub had not been emptied from a previous occasion. In all incidents the mother returned to find the child lying under water. Children between six months and one year old can generally sit unaided but may not be able to right themselves if submerged.[15]

Young children are top heavy and whilst leaning forward can easily topple into a water hazard and drown. An infant can swallow water, sink and lose consciousness in

less than a minute, which explains how a brief lapse of direct adult supervision while bathing a child can lead to tragedy.

Buckets accounted for a small percentage of the WA drowning incidents. Buckets of a 10 litre capacity or greater tend to pose the greatest hazard. Industrial buckets have been recognised in parts of the USA and South Africa as a source of childhood drowning. [17, 21] Young children with relatively large heads and high centre of gravity can fall in without up-ending the bucket and drown in even a small volume of water. In all WA cases the mothers were attending to other domestic duties for a period of five to ten minutes before noticing the child's absence, commencing a search, and subsequently finding the child toppled head first into the container. Although this study does not address near-drowning episodes, bucket-related mortality may be high due to the toxic material often in the buckets at the time of immersion.

Studies both nationally and internationally have identified rivers, lakes and creeks as a common drowning site for older children, particularly males. Higher fatality rates occur because of the site's isolation, delayed rescue and resuscitation efforts.[5, 15, 17] Children living in WA's rural communities are more likely to drown in open bodies of water. A child of 12 months travelled 180m from the parent's property where she drowned in a river. Another 21 month old child walked 100m from the family home through an orchard and drowned while trying to retrieve a ball from a dam. Generally the children left the house before parents awoke or were left to play alone outside for short periods, in which time they wandered to the open body of water, on average 50-200m from the residence, and drowned.

The lack of adequate adult supervision has been identified as an important causal factor in childhood immersions, no matter whether the incident occurred in a bath, swimming pool or natural water hazard. Many instances involved a lapse in supervision for no more than two to five minutes.[15, 17, 19] The Brisbane Drowning Study identified lack of parental supervision as a contributing factor in 71% of all serious childhood
immersions.[12] None of the reports considered the parents or carers to be neglectful in regard to their duty of care.

Some of the variables in the coronial reports (1987-1996) appeared in too small a number to be classified as a contributing factor. According to the Brisbane Drowning Study[5] there is no evidence that children under three years who have learnt to swim are any less vulnerable near water hazards. There is little agreement in current literature as to the age at which a child has adequate motor skills to be able to float or swim.[15,17] Even if the children possess water survival skills they will usually be inhibited when their clothing becomes water logged and heavy or lack behavioural skills to respond to an emergency.

Very little information is available regarding family size and parental age. From the information recorded in the coronial reports, the occurrence of a drowning incident in large families appears to be the exception rather than the rule, an outcome which is inconsistent with other studies. However, caution should be exercised in drawing conclusions from this information due to the small numbers involved. Parental age, in general is approximately 30 years which appears to be consistent with other Australian literature.[8]

The only study to identify toys or floating objects as a contributing factor is the Brisbane Drowning Study. Floating objects were identified in 20% of the Brisbane cases studied.[5] Although rarely documented, toys and floating objects are recognised in this and other studies as a potential risk factor.

5.0 CONCLUSION

A detailed examination of WA coronial reports on drowning incidents in children 0-4 years over a ten year period (1987-1996) has provided an insight into the risks and key factors associated with immersion incidents.

Socio-demographic factors

- males are consistently over represented in all cases of childhood drownings;
- 41% of cases occur in children aged between 12 and 23 months;
- infants under one year most frequently drowned in baths and buckets;
- children living in the country are three times more likely to drown than those in the metropolitan area with rural/natural water hazards and swimming pools equally as hazardous;
- aboriginal children drowned at a rate two and one half times that of non-aboriginal children, mostly in rural or natural water hazards;
- drownings occur throughout the year with the majority (41%) occurring during the summer;
- the majority of drownings occur between 4-6pm (31%) and 10am-12noon (21%);
- children living in Perth's less advantaged eastern division are three times more likely to drown in both private swimming pools and bathtubs;
- average number of siblings of drowned children is; 1.4
- average parental age of the drowned children 29.5 years.

Environmental factors

- the majority (61%) of swimming pool deaths occur in backyard pools;
- the majority (84%) of victims are residents or invited guests;
- in the majority (75%) of coronial reports on private swimming pool drownings, there was direct access to the pool area from the house, gates were faulty or open, or fencing non-existent or defective;
- 75% of the private swimming pool drownings studied could have been prevented had isolation fencing and functioning gates been in place;
- children as young as 12 months have travelled an average 50-200m from the residence before drowning in a rural/natural water hazard;
- uncovered garden ponds pose a risk to young children;
- there is insufficient evidence to determine if floating objects are a contributing factor;
- of the cases where pool age was identified, 99.5% were pre-July 1992.

Parent related factors

- 77% of drowning reports state that the child was clothed at the time of immersion;
- there was a lack of direct adult supervision;

- the parent or carer erroneously believed the child was playing with or in the care of other children;
- there was an erroneous belief that structural safety measures were in place and/or in working order;
- the parent or carer erroneously believed the child could be safely left unattended for 2-5 minutes;
- there was an unrealistic expectation that the child would obey instructions and stay away from the water hazard.

Child related factors

- children are attracted to water;
- a child can drown silently in under two minutes;
- infants are top heavy so can topple easily into water hazards;
- there is insufficient evidence to suggest a child under three years can develop adequate swimming skills to prevent drowning;
- a young child lacks sufficient physical development and co-ordination to survive an immersion incident.

By clarifying the factors that contribute and occur prior to a drowning incident involving WA children 0-4 years, important safety measures relating to water hazards can be identified.

Footnote

PMH Emergency department records and coronial reports identified eight drowning incidents and 24 near-drowning episodes for children aged 0-4 years in 1997. This number is consistent with the annual average of 7.9. These figures may not include all rural drowning incidents or presentations to other hospitals and medical centres. WA will need to be committed to improving and sustaining anti-drowning safety measures before the National Water Safety Council's goal of zero tolerance to childhood drowning can be achieved.

6.0 RECOMMENDATIONS

Legislation

- Repeal existing Western Australian Uniform Private Swimming Pool By-laws.
- Introduce compulsory isolation fencing for all new private swimming pools and spas.
- Ensure the tabling of additional provisions for existing pools.
- Ensure current private swimming pool legislation be *uniform* including properties outside town sites in rural areas.
- Introduce regulations to enforce that pool fencing and gates are inspected annually by local councils or authorised independent.
- Increased fines for non compliance.

Advocacy

- Encourage local councils to utilise the Royal Life Saving Society's Backyard Pool Inspection Program.
- Obtain commitment of the Swimming Pool and Spa Association to safety and the prevention of childhood drowning.
- Promote a comprehensive approach incorporating passive protection, swimming and water safety instruction, and parental awareness and supervision.
- Support and encourage implementation of the 'National Water Safety Plan'.

Education

- Ensure sufficient resource be made available for ongoing public education on water safety
- Ensure resources be made available for in servicing building surveyors as to the uniform interpretation and application of the by-laws.
- Encourage the introduction of incentive based schemes to increase participation by pool owners in CPR training.
- Provide resources to integrate an injury prevention program into primary care (ie community based nursing).[23]

Research

- Review International Classification of Diseases Supplementary Classification (ICD) eternal causes (E) codes for drowning.
- Introduce multiple cause coding and the inclusion of free text narratives in the data base.[24]
- Establish an updated classification for drowning and near-drowning episodes according to severity.[25]
- Allocate funds to duplicate the 'Pool Survey: Water Safety Study' conducted for University of Queensland, 1996, in Western Australia.

Monitoring

- Introduce surveillance systems to include drowning and near-drowning incidents.
- Allocate funding for a national drowning register.
- Disseminated information and provide access to relevant organisations.

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APPENDIX I.

International Comparison Ranked By Toddler Drownings as a Percentage of Total Drownings

	Country	Year	Total Drowned	Toddlers Drowned	% of Total	Rate/ 100,000
1	Malta	1992	4	0	0%	0.00
2	Luxembourg	1992	3	0	0%	0.00
3	Greece	1991	298	3	1%	0.57
4	Trinidad and Tobago	1991	70	1	1%	0.67
5	Mauritius	1992	45	1	2%	0.98
6	Hungary	1992	392	9	2%	1.46
7	Finland	1992	169	4	2%	1.24
8	Italy	1990	525	16	3%	0.56
9	Bulgaria	1992	255	11	4%	2.20
10	Poland	1992	1,746	87	5%	3.15
11	Czech Republic	1992	293	16	5%	2.51
12	Russian Fed	1991	13,762	780	6%	7.11
13	Romania	1992	1,480	85	6%	5.44
14	Spain	1990	790	49	6%	2.33
15	Belgium	1989	93	6	6%	1.02
16	Portugal	1992	100	7	7%	1.27
17	Norway	1991	84	6	7%	2.07
18	Japan	1992	3,269	240	7%	3.89
19	Sweden	1990	111	9	8%	1.63
20	Ireland	1991	69	6	9%	2.22
21	Austria	1992	119	11	9%	2.38
22	Costa Rica	1991	137	13	9%	3.18
23	France	1991	657	64	10%	1.70
24	Lithuania	1990	414	41	10%	14.10
25	Puerto Rico	1991	87	9	10%	2.77
26	Switzerland	1992	91	10	11%	2.41
27	UK	1992	312	35	11%	0.89
28	Canada	1991	390	44	11%	2.31
29	New Zealand	1991	70	8	11%	2.87
30	Germany	1991	773	106	14%	2.36
31	Hong Kong	1991	51	7	14%	1.90
32	Mexico	1991	3,826	544	14%	4.72
33	Armenia	1990	55	8	15%	2.17
34	Israel	1990	47	7	15%	1.39
35	Singapore	1991	20	3	15%	1.28
36	USA	1990	3,979	636	16%	3.40
37	Iceland	1992	6	1	17%	4.54
38	Argentina	1990	849	187	22%	5.78
39	Denmark	1992	31	7	23%	2.24
40	**Australia**	**1992**	**291**	**76**	**26%**	**5.90**
41	Netherlands	1991	83	26	31%	2.72

*Source: World Health Organisation

APPENDIX II.

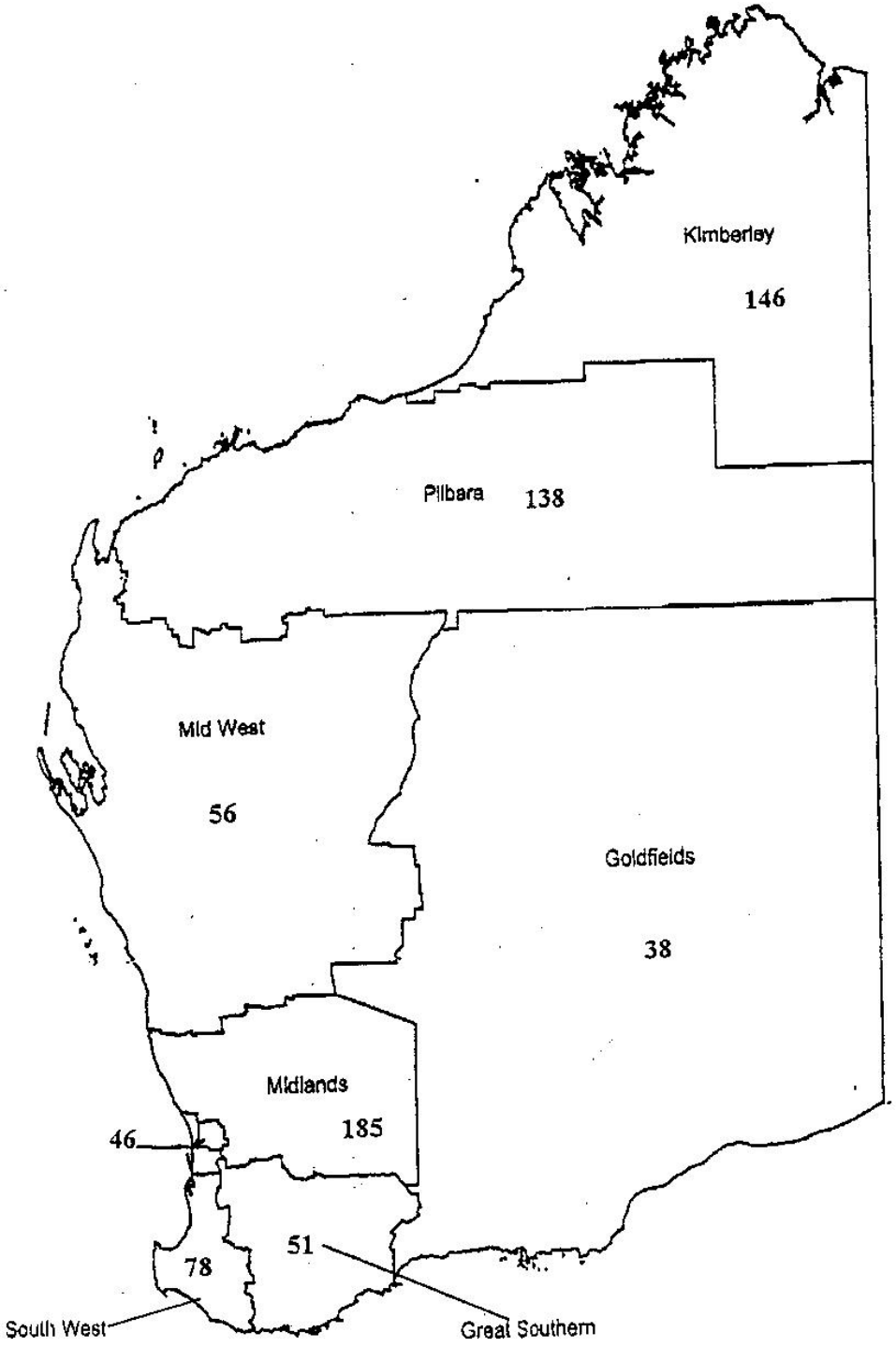
Sixteen causes of child drowning and near-drowning identified through reconstruction of the incident with parents for the Brisbane Drowning Study.

Causes of drowning incidents
1. Absence of a pool fence
2. Inadequate pool fence
3. Inadequate pool gate
4. Child unsupervised
5. Vulnerable period for caretakers or child
6. Attractive objects in pool
7. Dichotomy of care
8. Unrealistic disciplinary expectations
9. False security (child left with other children)
10. Safety features misused
11. Unfulfilled expectations of the child
12. Child disobedient
13. 'Floaties'
14. motor vehicle accident
15. Child neglect
16. Injury in or beside the water

Nixon, Pearn, Oldenburg and Pitt, 10:1995

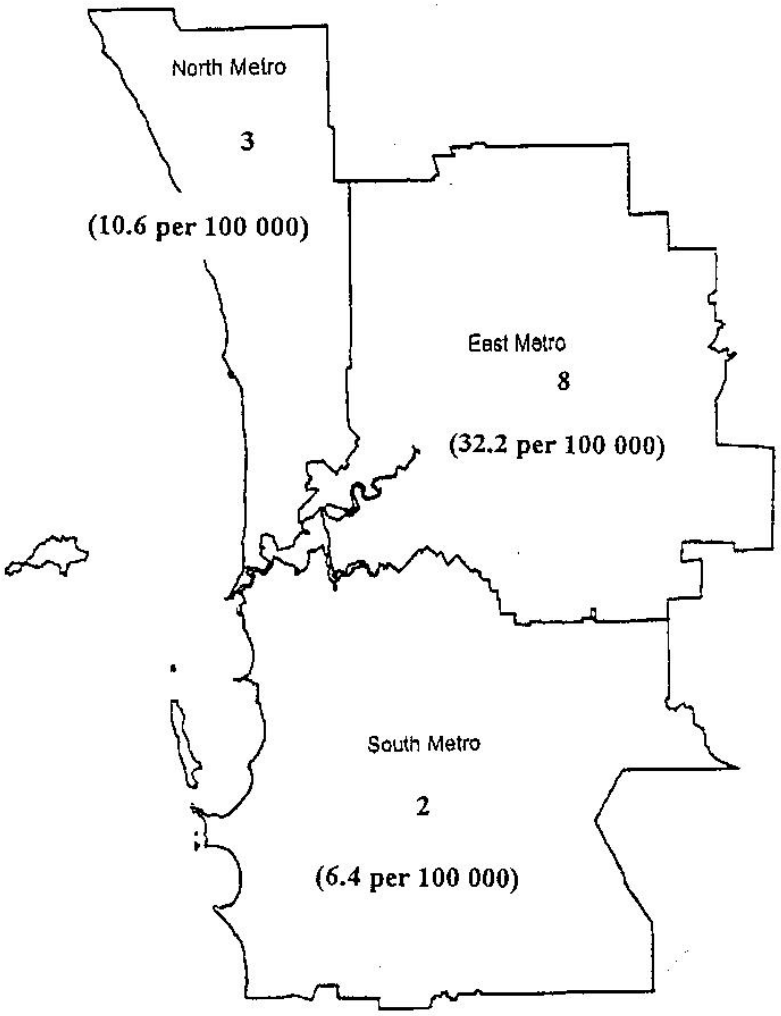
APPENDIX III.

Drowning Deaths of Children 0-4 Years 1987-1996 by Geographical Location



APPENDIX IV.

Drowning Deaths of Children 0-4 Years 1987-1996 by Metropolitian Health Divisions.



ACKNOWLEDGMENTS

Injury Control Program, Health Department of Western Australia.

The Royal Life Saving Society Australia (WA Branch).

Max Bulsara, The University of Western Australia, Department of Public Health. *Biostatistical Consulting Service.*

Coroner's Office, Perth, Western Australia.

Eleanor Wilshire, Project Management Consultant.

Mary Davies, Executive Officer, Kidsafe WA.

Dr Nerida Dilworth, State Council, Kidsafe WA.